DOCUMENT RESUME

ED 154 793 IR 005 858

AUTHOR Brekka, Lawrence T.; Revani, Behruz
TITLE Use of Television and Teacher Training. Technical Report No. 20.
INSTITUTION Stanford Univ., Calif. Stanford Electronics Labs.
SPONS AGENCY National Iranian Radio and Television, Tehran.
PUB DATE Dec 76
NOTE 100p.; Pages 7-18 of Appendix C have been removed due to poor reproducibility; For related document, See IR 005 859

EDRS PRICE MF-$0.83 HC-$4.67 Plus Postage.
DESCRIPTORS *Computer Oriented Programs; Cost Effectiveness; Developing Nations; *Educational Demand; *Educational Television; Enrollment; Manpower Needs; *Models; *Resource Allocations; Systems Development; *Teacher Education
IDENTIFIERS Iran

ABSTRACT

The potential value of the use of television in teacher training in Iran to help fill the gap between the present work force of teachers and the number needed for full enrollment of the nation's children at the elementary and secondary levels is considered. A computer model which has been developed to permit quick and easy assessment of the impact of alternative educational strategies, including educational television (ETV), is provided for use by Educational Radio and Television of Iran (ERTI) in planning its role in teacher training. The report contains a summary of the major findings and recommendations, description of the background research which led to the development of the analysis, and the analytical model and its result. Appendix A presents a brief overview of how ETV has been successfully used in a range of applications at the elementary, secondary, and post secondary levels outside Iran. Appendix B includes detailed information from a survey on ETV use in such institutions as Chicago TV College, Outreach Consortium, Oregon State University, and British Open University. (VT)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED154793

USE OF TELEVISION AND TEACHER TRAINING

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Bruce B. Lusignan

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

by

L.T. Brekka
Behruz Revani

December 1976

Technical Report No. 20
Prepared under
National Iranian Radio and Television Contract
NIRT No. 1

Radioscience Laboratory
COMMUNICATION SATELLITE PLANNING CENTER
Stanford University
Stanford, California

IR005858

TABLE OF CONTENTS

	Page
USE OF TELEVISION AND TEACHER TRAINING.	1
A. INTRODUCTION	1
B. MAJOR FINDINGS AND RECOMMENDATIONS	1
1. Findings	1
2. Recommendations.	7
C. BACKGROUND	8
1. The most effective use of television for massive training programs is as a replacement for live lectures to mature students	9
2. Television increases the total number of students that one principal instructor or mentor can handle.	9
3. Television allows the use of less highly trained instructional staff for student interaction	11
4. Television is effective in reaching students at remote locations.	11
D. APPROACH	12
1. Basic Concept of the Model	13
2. Computer Model	13
E. RESULTS.	17
F. CONCLUSION	31
APPENDIX A - Successful Applications of Educational Television(ETV)	A-1
APPENDIX B - Survey Results -- ETV Use.	B-1
APPENDIX C - Program Listing.	C-1
References	

LIST OF ILLUSTRATIONS

Figure		Page
1-a	Effect of TV on Meeting Teacher Need, Unconstrained Case (see footnote, Table 1).	3
1-b	Effect of TV on Meeting Teacher Need, Limited Case (see footnote, Table 1)	4
2	Staff Composition: 10-Year Projection to 1987.	6
3	Acceleration of Teacher Training with Television	14
4	Chart of the System of Formal Education in Iran (The New System).	15
5	Flow of Trainees and Staff	16
6	Student Enrollment: Limited Case with TV.	18
7	Student Enrollment: Limited Case, Conventional	20
8	Student Enrollment: Unconstrained Case with TV	22
9	Student Enrollment: Unconstrained Case, Conventional . . .	24
10	Effect of Restricting AA Degree to Guidance Cycle Schools.	29
11	Effect of Fixed In-Service Training.	30
12	Effect of Large Teacher Retirement Rate.	32

LIST OF TABLES

Table		Page
1	Effect of Television on Primary, Guidance Cycle and Secondary School Graduates	5
2	Summary of TV Use Data	10
3	The Effect of Television on the Time to Achieve Full Enrollments.	21
4	Projected Entry Rates into Teacher Training, 1978.	25
5	Faculty Salary Cost Per Trainee	27
6	Student Drop-Out Rates and Effects	33

USE OF TELEVISION AND TEACHER TRAINING

A. INTRODUCTION

The use of this report is to show how the use of television for teacher training in Iran can help fill the gap between the present workforce of teachers and the number needed for full enrollment of the nation's children at the elementary and secondary levels. The study reported here emphasized understanding of the mechanism by which educational television could play a role at the elementary and secondary levels in Iran. Implications are drawn on allocation of resources between programming designed for broadcast directly to the children and the alternative use of resources for teacher training programs. A computer model of the Iranian education system has been developed to permit quick and easy assessment of the impact of alternative educational strategies, including the use of educational television. The computer model can be used by Educational Radio and Television of Iran (ERTI) in planning its role in teacher training. The following sections contain a summary of the major findings and recommendations, description of the background research which led to the development of the analysis, and the analytical model and its results.

B. MAJOR FINDINGS AND RECOMMENDATIONS

1. Findings

The use of television in teacher training is potentially a very important factor in Iran's economic development. It is critical that a well educated, trainable population be developed through the operations of the elementary and secondary schools. A well educated base of high school graduates is needed to provide entrants to the professional, technical, administrative and managerial fields through university programs, and direct entrance to the workforce through on-the-job or vocational school training programs. At the present time there are not enough qualified teachers at the elementary and secondary level to provide this base. A rapid increase is needed immediately in the training of teachers.

The analysis reported here establishes that television provides a means of accelerating teacher training far beyond the capabilities of a conventional educational system. The use of television could enable the country to achieve enrollment goals earlier than with conventional teacher

training methods. Specifically, the use of television has the following effects:

- Four or more years can be saved in achieving goals of full enrollment in the elementary and secondary schools (Fig. 1).
- Over a 10 year period, there can be between a half million and a million additional high school graudates (Table 1).
- Over a 10 year period, there is an important increase in the proportion of teachers with adequate and higher standard credentials. The effect is most significant at the high school level in terms of the proportion of teachers with bachelor degrees. The proportion increases from one-fourth to one-third with conventional training to three-fourths or higher with television (Fig. 2).
- The cost of training each teacher is more than halved.

In order to maximize the benefits of television, high entry rates are needed into teacher training. The analysis presented in this report substantiates that television-based training has far more capacity than is needed to meet national goals in Iran. It is the availability of entering trainees that is the limiting factor on reaching goals.

Table 1 shows that when peak entry rates are tripled the total number of primary grade graduates increases by two-thirds of a million when television is used compared to an increase of only 200,000 with conventional teacher training. At the high school level the increase in graduates over a 10 year period is over half a million with television as compared to 80,000 for conventional training. Therefore, with television there can be major gains from incentive programs to increase the number of new trainees. In a related matter, the analysis presented here shows that television can help make up for high loss rates among qualified teachers much better than conventional training. With television, higher replacement rates can be maintained. It is expected that a number of entrants in the range presented here could be achieved in Iran by drawing on members of the present workforce as well as high school students. Small portions of two to three percent of the workforce changing over to teaching would suffice.

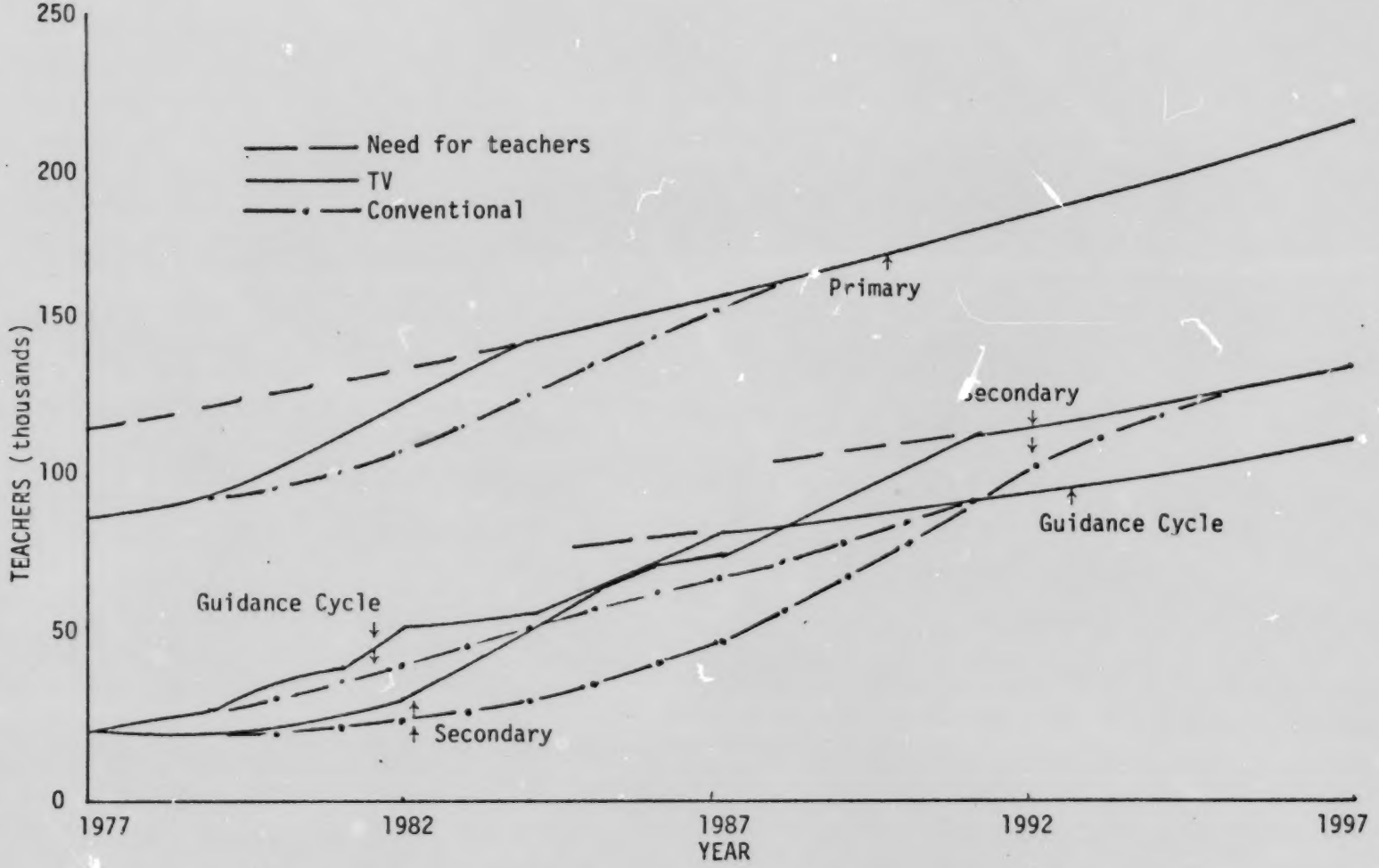


Fig. 1-a Effect of TV on Meeting Teacher Need, Unconstrained Case (see footnote, Table 1).

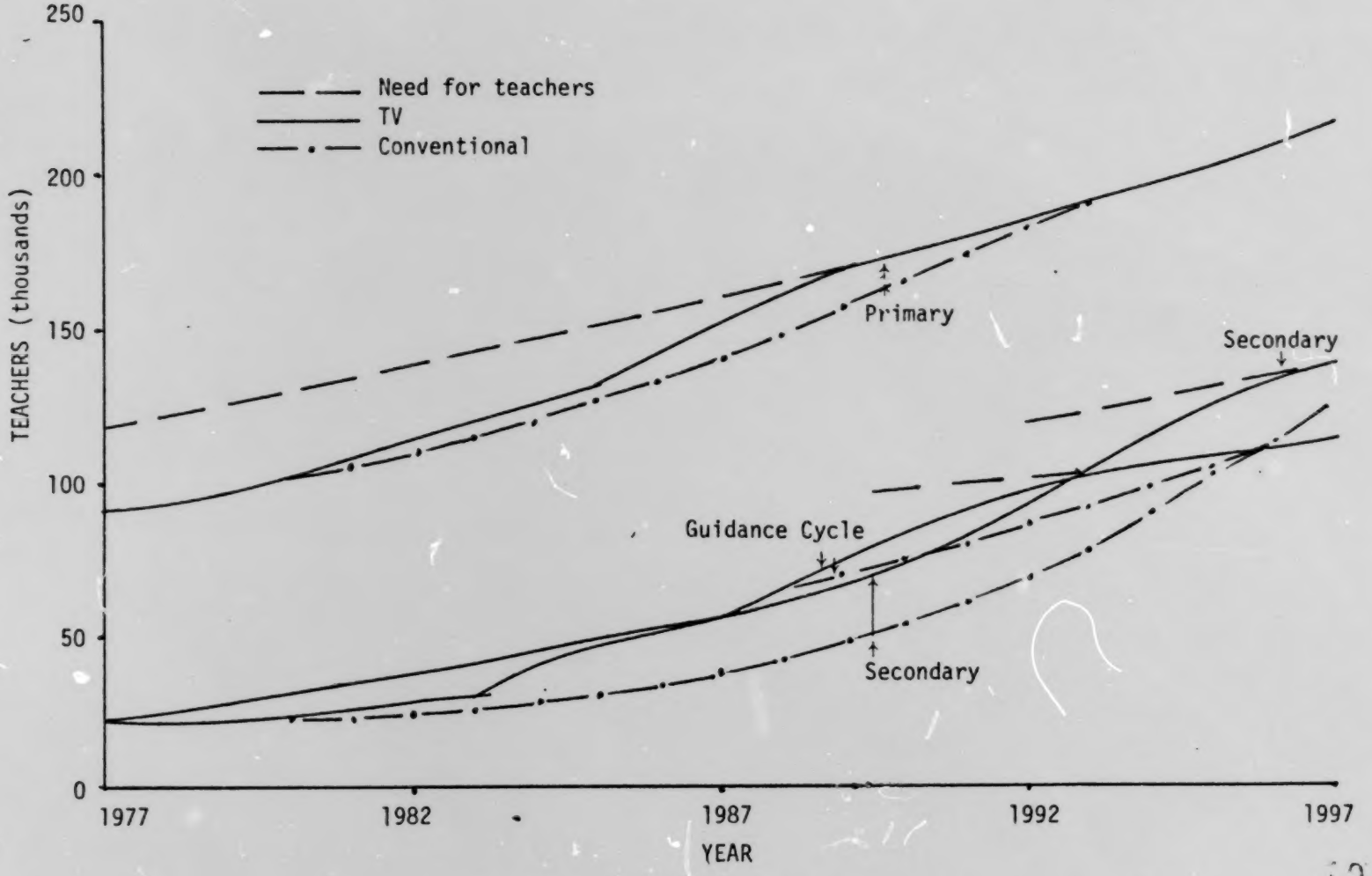


Fig. 1-b Effect of TV on Meeting Teacher Need, Limited Case (see footnote, Table 1).

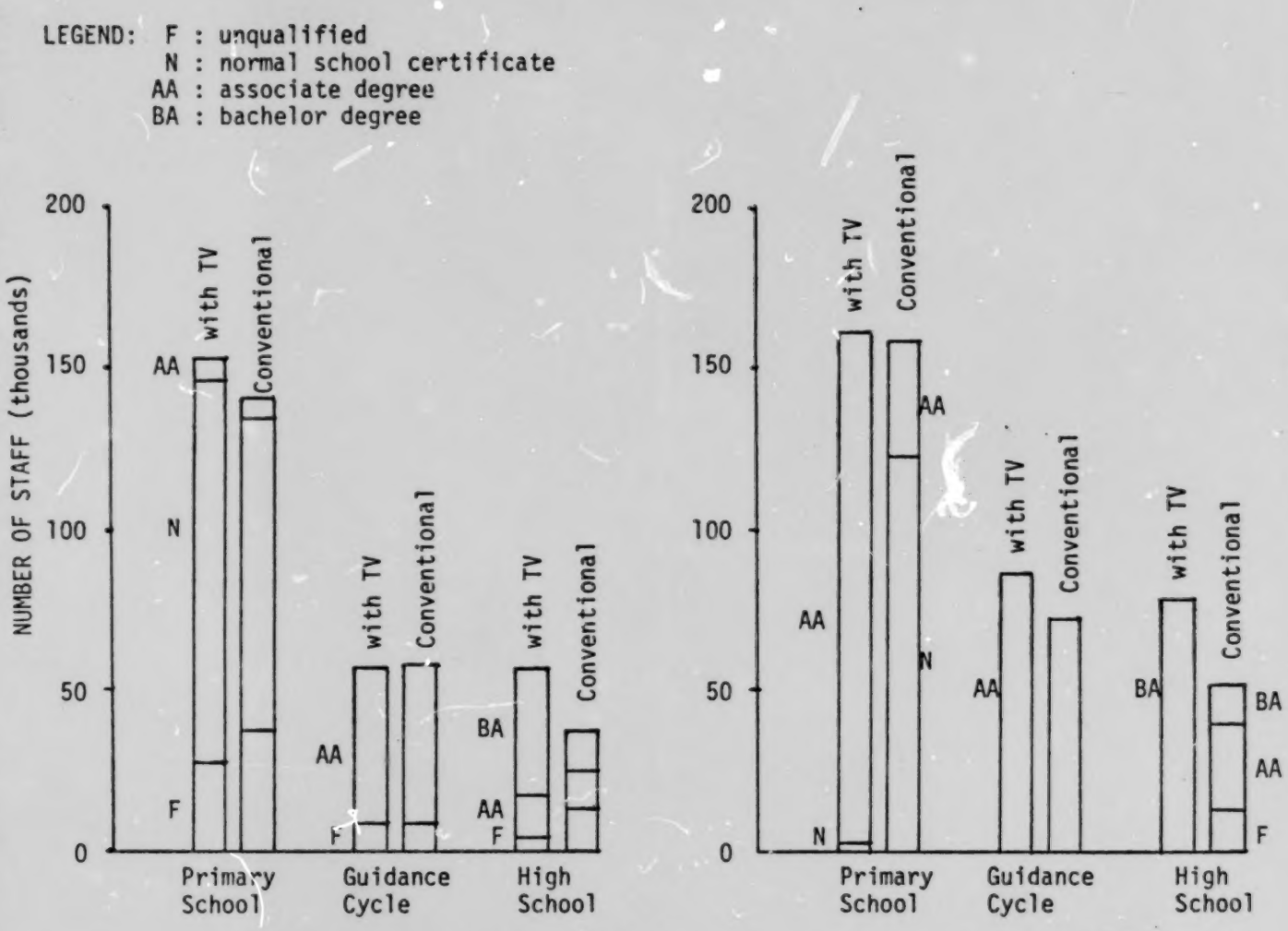
Table 1

Effect of Television on Primary,
Guidance Cycle and Secondary School Graduates

Case*	Cumulative Total of Completions Over Ten Years (1977-1987) (in millions)		
	Primary	Guidance Cycle	Secondary
Unconstrained			
With television	9.20	6.42	3.57
Conventional	8.51	5.67	2.55
Limited Entry			
With television	8.53	4.93	2.95
Conventional	8.31	5.06	2.47

*"Unconstrained" is the case with a limit of 10 percent on the projection in any one year of (1) ninth grade completions entering normal school, (2) secondary school graduates entering a two year college, (3) secondary school graduates entering the education degree program in the university. The results are essentially those of an unconstrained entry rate.

"Limited entry" assumes a 3 percent limit on entry to each type of training institution.



a. Constrained Case (Maximum of 3% of high school class to enter each type of teacher training institution)

b. Unconstrained Case

Fig. 2 Staff Composition: 10-Year Projection to 1987

Finally, it should be noted that the results presented here assume that a two year college program could train teachers for assignment in primary and high schools. At present most of Iran's two year colleges are guidance cycle training centers, preparing teachers for guidance cycle assignments. The use of two-year program graduates at primary and high school levels is an important factor in meeting needs early.

2. Recommendations

ERTI is in a position to contribute to the development of effective television-based teacher training programs. There are basically two areas of potential activity on the part of ERTI. One is to expand upon the present television programming of the Free University of Iran (FUI). That institution has developed a curriculum for training teachers in rural Iran and designed a media package as a means of distribution. At the present time there is a heavy emphasis on the use of printed material and much less emphasis on the use of television. It is recommended that ERTI work with FUI to increase the use of television programming in the curriculum. It is expected that this will result in an expansive growth of the FUI's teacher training program.

The second major area of activity for ERTI would be to introduce television-based training to the Ministry of Education in-service programs and to the teacher training programs of higher education institutions in Iran.

In order to properly plan for expanded use of television in FUI programs and introduction of new teacher training programs using television, ERTI should improve the data used in the present analysis and modify the computer program to fit the policies of the Iranian government more closely. Using the computer program, ERTI can then project alternative uses of television in teacher training and assess the value of ERTI's participation in specific programs.

If there is any competition for resources between direct programming for children and programming for teachers, it is recommended that priority be given to teacher training. The analysis of this study shows that TV can promote the rapid expansion of training programs for adults.

It cannot do the same with children. However, there may be a role for TV directly instructing children in specialty subjects, or in providing motivation. It is therefore also recommended that ERTI establish a joint planning group with the Ministry of Education to establish priorities in the use of TV. The results presented in this report should be used to support the major use of TV for teachers.

Finally, ERTI should support programs and policies which attract additional people into teacher training and a career as teachers. This makes the use of television even more fruitful for the nation.

C. BACKGROUND

A survey was conducted of successful educational television programming from kindergarten through university levels in order to determine what characteristics might be useful in Iran. Specifically, three major effects of the use of television were examined:

- The total number of students who can be managed by one instructional staff member with television, either principal instructor or mentor. Mentors are less highly trained members of the instructional staff who interact with students.
- The effectiveness of television in allowing mentors to assume the role of in-class instructor.
- The efficiency of television in increasing the accessibility of education to students in outlying geographic areas and/or to others who are unable to acquire an education in the traditional setting.

There is sufficient information in the literature to describe these effects at the elementary and secondary levels. However, the published data on the use of television with mature students at the advanced secondary or the postsecondary levels are inadequate. It was, therefore, necessary to conduct a survey of such use and relate the results to the Iranian situation.

Seven cases from the United States and Great Britain were chosen for study: Chicago TV College, Stanford University's Engineering Telecourses, the Association for Continuing Education, Outreach Consortium, Coast Community College District, Oregon State University, and the

British Open University. Each of these uses television to substitute for live lectures to mature audiences. They include postsecondary degree programs, special subject-oriented programs and vocational training. In all cases, the use of television is one component of a total instructional program which includes supporting printed material and also provides for direct student interaction with a teacher or mentor.

The results from the literature on successful uses of television and the results from the survey of the higher education institutions are described in Appendix A. Appendix B contains detailed survey data. The case study results are summarized in Table 2.

The major conclusions are as follows:

1. The most effective use of television for massive training programs is as a replacement for live lectures to mature students.

   - Use of television at the elementary and lower secondary levels, such as at Hagerstown, Maryland and Anaheim, California, provides gains of about 33 percent in increasing the number of students which can be taught by the instructional staff. This gain is small by comparison with what can be achieved with adult students, and reflects the need to maintain low student-teacher ratios with less mature students.

   - At the postsecondary level, the case studies show that television permits doubling and in some cases tripling the number of students who can be taught by a given size instructional staff.

   - By using less highly trained people as "mentors" for local interaction with the student, even greater expansion is possible for a given size academically-qualified staff. As many as 22 mentors have been used with a principal instructor, each serving 30 students (see Conclusion 3). This is not feasible for younger students.

2. Television increases the total number of students that one principal instructor or mentor can handle.

   Examples include:

   - In the case of Chicago TV College, a half-time instructor normally is limited to 70 students. With television, a single instructor was responsible on a half-time basis for 210 students in one course, a factor of three increase. In another course the increase was from a full-time instruction load of 140 to 550, a factor of four.

Table 2

Summary of TV Use Data

	Chicago TV College	Coast Community College District	Outreach Consortium[3]	Stanford Univ. Engineering Telecourse	Association for Continuing Education	Oregon State University	British Open University
Academic Qualifications of TV Instructor	B.A. to Ph.D. (60% Ph.D.)	B.A. to Ph.D. or non-academic	Experts from ed., business, gov't and medicine	Ph.D.	Experts from ed., gov't, bus., and consulting groups	Ph.D.	B.A./B.S. to Ph.D.
Academic Qualifications of Mentor	Mentors precluded by union regulations	TAs with B.A. or trained clerical staff	N.A.	Generally not used	Mentors not used	B.A./B.S. or advanced undergraduate	Minimum of B.A./B.S.
Number of Students per Principal Instructor Using TV	210 to 550	150 to 600	Institution estimates 1,000	Total number of remote sites: 36	10 (limit of 40 set by ACE)	700	N.A.
Number of Students per Mentor Using TV	—	150[1]	N.A.	—	—	30:1	12:1 to 20:1 maximum
Total TV Used	90 hrs/semester (repeated twice per week)	75-90 hrs/semester	15-hr. course	1,200 hrs/quarter	457 hrs/quarter	600 hrs/quarter on courses; 660 hrs. other uses[4]	37.5 hrs/week (equivalent of 450 hrs/quarter)
Principal Instructor's Time:							
• Preparing to Use TV Course	0 (principal instructor is TV instructor)	0 to 2 hrs/class hour	N.A. (self contained; could be 0)	Live lecture	Live lecture (initial preparation to use TV: 5-8 hours)	0 (principal instructor is TV instructor)	Principal instructor is TV instructor
• With TV Students	7.2 to 23.5 hrs/week	2-3 hrs/week[2] to 10 hrs/wk	N.A.	2-way audio feedback; minimal time outside class	2-way audio feedback; minimal time outside class	7 hrs/week	During summer school
• With Mentors	—	N.A.	N.A.	—	—	2 hrs/week	—
Mentor's Time:							
• Preparing to Use TV	—	N.A.	N.A.	—	—	2 hrs/class hour	N.A.
• With Students	—	N.A.	N.A.	—	—	2 hrs/week	22.5-27 hrs/week maximum

[1] In this case, the mentor role may be filled by associate professors in the user institution responsible to the department head (principal instructor), or by a course facilitator on the clerical staff (see text).

[2] Lower bound based on case where total reliance is placed on TV course and instructor/student interaction occurs over weekly telephone conference hours; upper bound based on case where supplementary recitation and discussion classes are held.

[3] This course was released in September 1975.

[4] Special services such as recording expensive laboratory experiments and training TV instructors.

- In the Coast Community College District, the number of students handled by a single instructor ranged from 150 to 600 in contrast to the average student-teacher ratio of 30:1. While supported by clerical assistants, the instructor was responsible for all content-related discussions with students.

The importance of these examples is that Iran, hampered in teacher training by lack of instructional staff, can reach more students with television than without.

3. Television allows the use of less highly trained instructional staff for student interaction.

- With Coast Community College District's televised courseware, the user institution has a range of choices in how the instructional staff will interact with students. One user of a psychology course, for example, made the principal instructor responsible for 600 students supported by a clerical staff and computerized grading. The principal instructor was available for telephone conferencing on content-related issues, with the clerical staff responsible for answering process-related issues. In another instance of a free-hand sketching course, a noncredentialed staff was to review, grade and comment on the student's work, under the principal instructor's guidance for an enrollment of 150 students.

- In the case of Oregon State University, one principal instructor, assisted by 22 teaching assistants at the advanced undergraduate or Bachelor's degree level, managed an enrollment of 700 in a biology course. The teaching assistants met with groups of 30 students for one hour per week in recitation.

These examples lead to the conclusion that, with television, Iran could use less highly trained mentors to interact with students. This is important because there are far more people qualified to be mentors than there are to be college or university faculty.

4. Television is effective in reaching students at remote locations.

- The Chicago TV College has awarded a total of 400 AA (Associate of Arts) degrees to students taking all course work via ETV; 75 percent of these students have been incarcerates in penal institutions. The college also has an annual enrollment of 9,000 overseas servicemen in academic and vocational training. The requirements for the degrees are the same as for on-campus students.

- The Coast Community College District conducted a post-course survey which revealed that 50 percent of the students would have been unable to take courses in the traditional setting. Courseware includes introductory postsecondary courses and general courses, such as sewing.

- Stanford University's Engineering telecourses were taken by 2,029 students in 1972-73, the majority of whom were full-time employees of the local industry users.

- British Open University's records indicated that only 2.5 percent of its students in 1974 were unemployed or retired and that 13.7 percent were housewives. Hence, British Open University is reaching people with less change to attend traditional education institutions. In addition, the Open University reached some 210 students in institutions.

- Oregon State University transmits its telecourses to an annual on-campus enrollment of 8,500, 70 percent of whom view the televised lectures off campus and attend recitation and laboratory sessions on campus.

This conclusion establishes a critical point in training teachers for Iran: that people in inaccessible areas can be effectively reached by television. Combined with the ability to use less highly trained people as mentors, this provides the basis for an effective remote area teacher training system of great importance for Iran's rural population.

More generally, the role of television can be seen as permitting the expansion of teacher education by having larger student-mentor ratios and by having the principal instructor manage a group of mentors in remote locations.

D. APPROACH

The assessment of television-based training and education programs shows that for adults the student/teacher ratio can be increased by factors as high as four. The use of mentors to interact with the students permits drawing instructional staff from a larger source. The next issue is to determine how that can affect Iran. National school systems are complex and it is not obvious what benefits will accrue with the introduction of television. In order to assess the potential impact of television,

a computer model was developed to show how the number of students moving through the elementary and secondary system is affected by the rate of training of teachers.

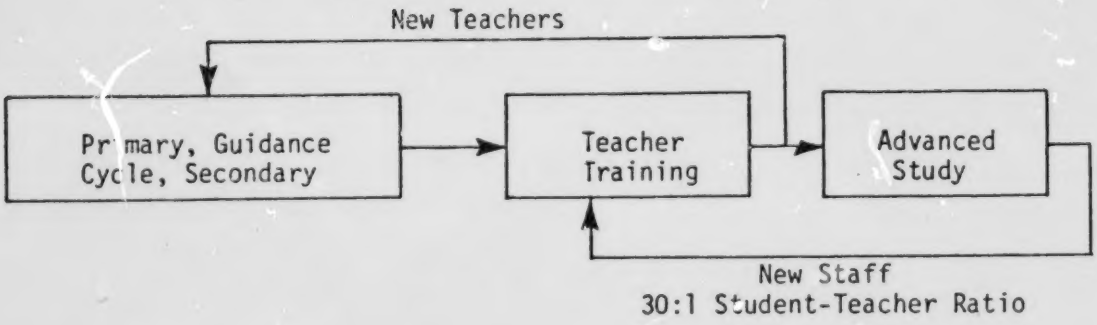
1. Basic Concept of the Model

The basic concept involved is that television permits utilization of recent graduates of an institution as mentors in that institution's courses. Normally, the graduates of a normal school or guidance cycle training center would have to go on for more study before being qualified to join the instructional staff. With television, however, that is not necessary since the lecture is televised, support material can be provided, and a highly trained principal instructor has overall responsibility for the course. Therefore, recent graduates can be used and the time needed to increase the instructional staff is shortened. Another important consideration is that since the lectures and a significant amount of support material are already prepared, the mentors have more time for dealing with students and can handle larger classes. Figure 3 demonstrates the difference between the use of television and traditional approaches, showing the major increase in the ratio of total course enrollment to the principal instructor.

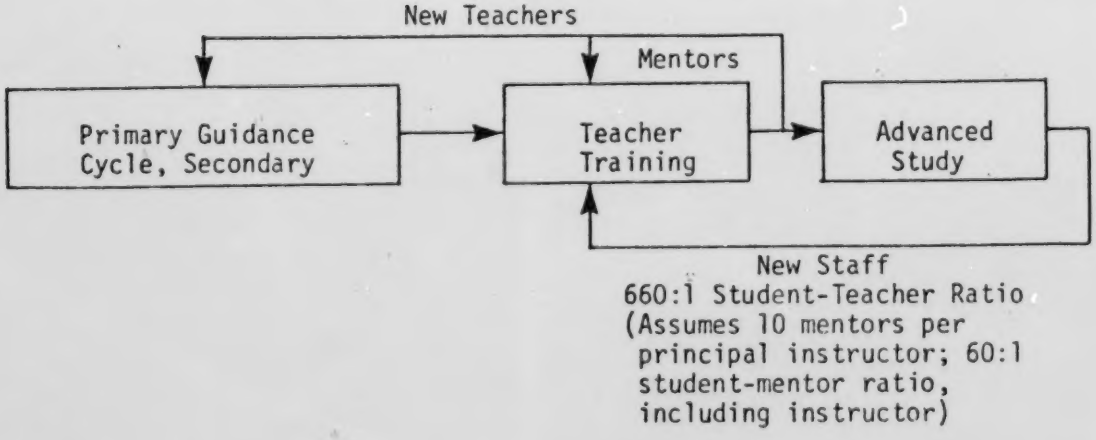
2. Computer Model

The modeling is based on the elementary and secondary school system concept shown in Fig. 4. There have been some changes in the actual organization of the Iranian school system since the publication of this description. However, the changes, most of which took place at the high school level, are not critical in terms of the validity of the analysis that was carried out.

Figure 5 shows the flow of trainees, staff and students assumed for the computer program. The three types of schools from the first through the twelfth grades are included in the model. In addition, three levels of teacher training institutions are considered. The normal school, as incorporated into the model, functions the same as the existing normal schools in Iran. The guidance cycle training center, in addition to providing teachers for the guidance cycle schools, is assumed to be a two-year post high school program which prepares people to teach at either

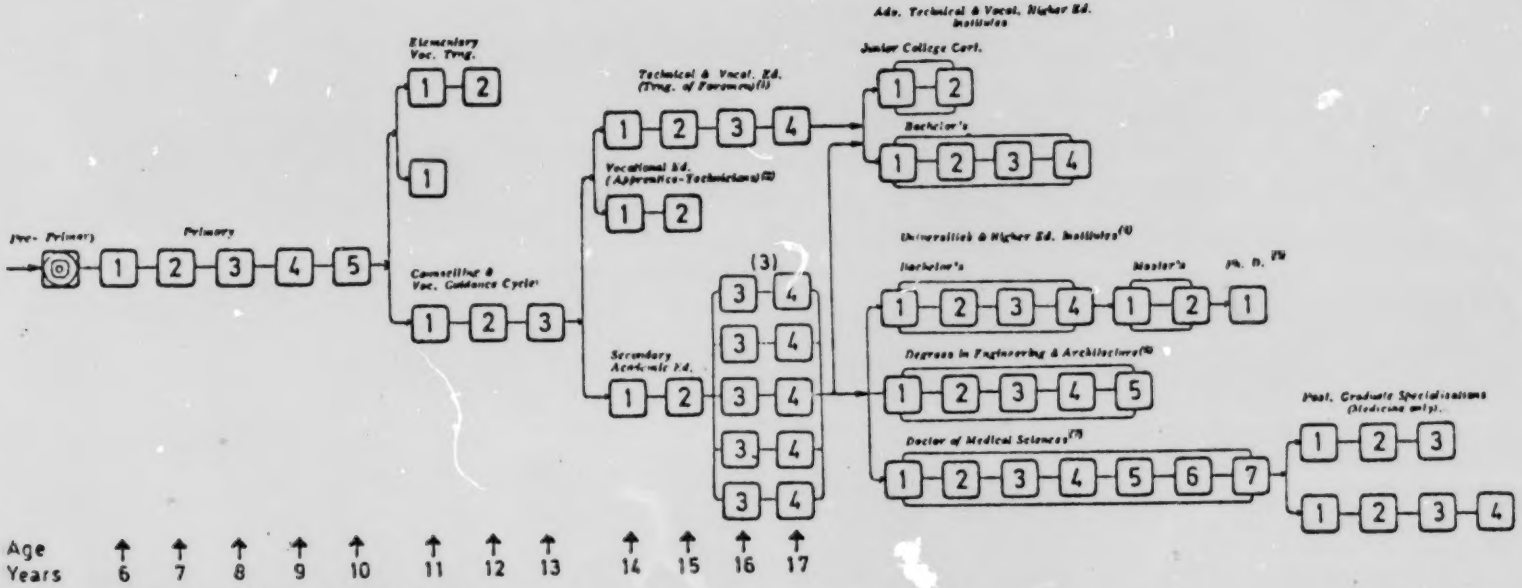


a. Traditional System



b. Television System

Fig. 3. Acceleration of Teacher Training with Television



(1) This is equivalent to 2nd Degree Technicians (Assistant - Technicians).
(2) This course may be abolished in the near-future.
(3) At present, 10 fields of specialization are offered. These are : Mathematics; Natural Sciences; Literature & Humanities; Foreign Languages; Education; Economics; Sociology & Social Studies; Statistics; Nutrition & Home Economics; and Art. These fields are subject to changes as decisions are not finalized.
(4) These are average durations required for the completion of each level of study. These durations sometimes vary between higher education establishments.
(5) Doctorate requires minimum period of 1 year and maximum period of 3 years.
(6) Possible to obtain degree equivalent to B.Sc. after 4 years and M.Sc. after 5 years at some Higher Education institutions.
(7) Doctoral for Pharmacy, Dentistry, and Veterinary Medicine usually requires a minimum period of 6 years.

Fig. 4. Chart of the System of Formal Education in Iran. (The New System) [5]

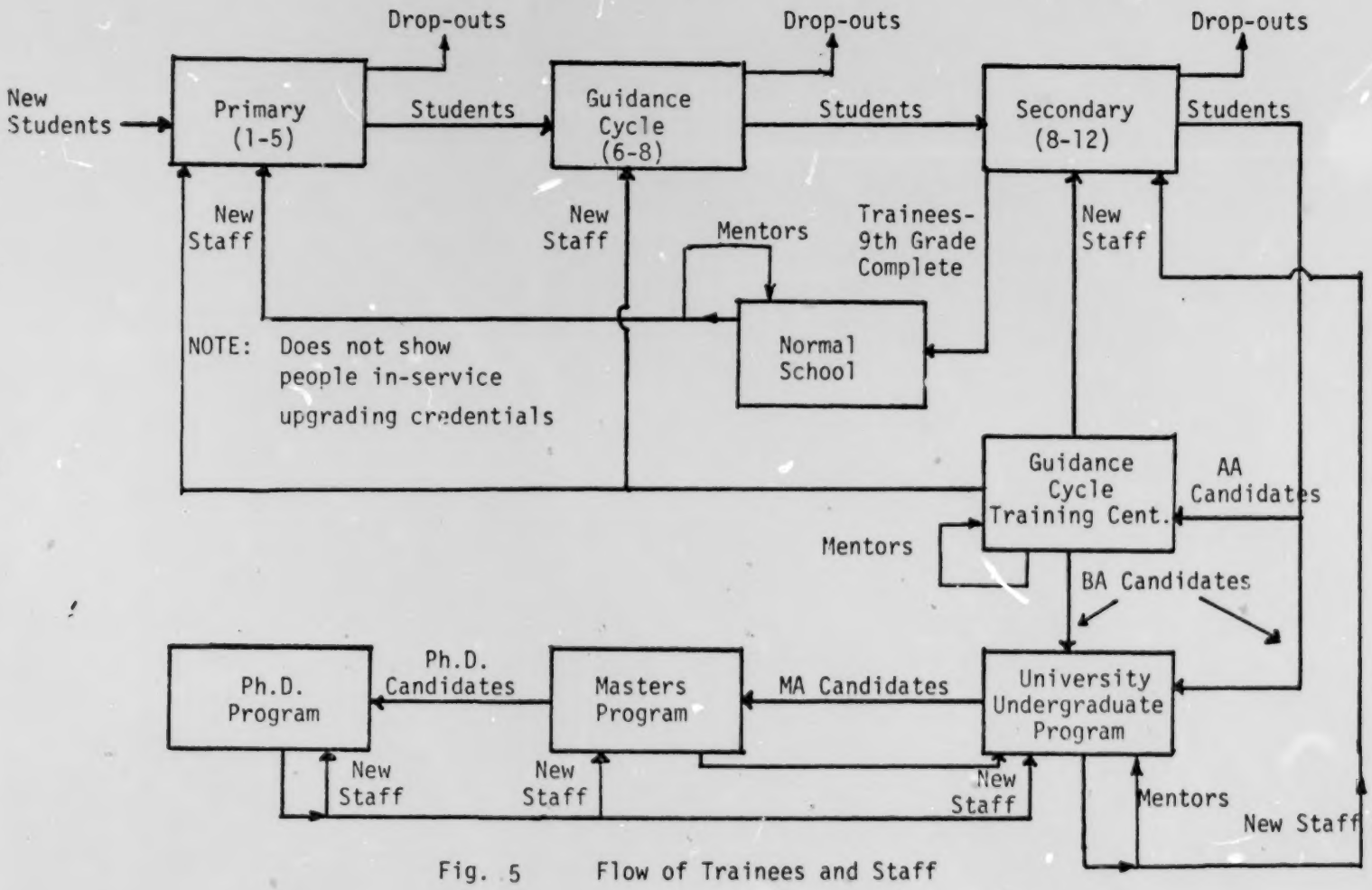


Fig. 5 Flow of Trainees and Staff

the primary, guidance cycle, or high school levels. This assumption is shown to be important in meeting Iran's needs. The university component of the model is concerned only with the education portion of the university system. That is, it models the activities of schools of education within a larger university and assumes only a portion of high school graudates become involved in the education program.

A program listing is included in Appendix C for use by ERTI in its own planning department. It is written in FORTRAN and can be run on computers available to ERTI.

A number of issues were examined with the use of the computer program:

- The relative effect of the use of television compared to conventional training programs on the time it takes to fully staff the schools so no students are turned away for lack of teachers.
- The number of people needed to enter the teaching profession and where they are to be found.
- The cost of training teachers.
- The potential role of the associate degree in meeting the need for primary and high school teachers as well as guidance cycle teachers.
- The potential role of in-service training to upgrade the skills of presently unqualified teachers.
- The effect of high rates of resignation from teaching positions.
- The effect of student dropouts on the need for teachers and the ability to meet realistically full enrollments.

E. RESULTS

Figure 6 shows a plot of the students enrolled in the first, fifth, eighth and twelfth grades when the teachers of the system are trained using television. The fifth, eighth and twelfth grades are the completion levels for the primary, guidance cycle and secondary schools, respectively. These curves assume that 3 percent of the students completing the ninth grade enter the normal school for teacher training, 3 percent of high school graduates enter the guidance cycle training centers for an associate degree program and 3 percent enter the university for a degree in

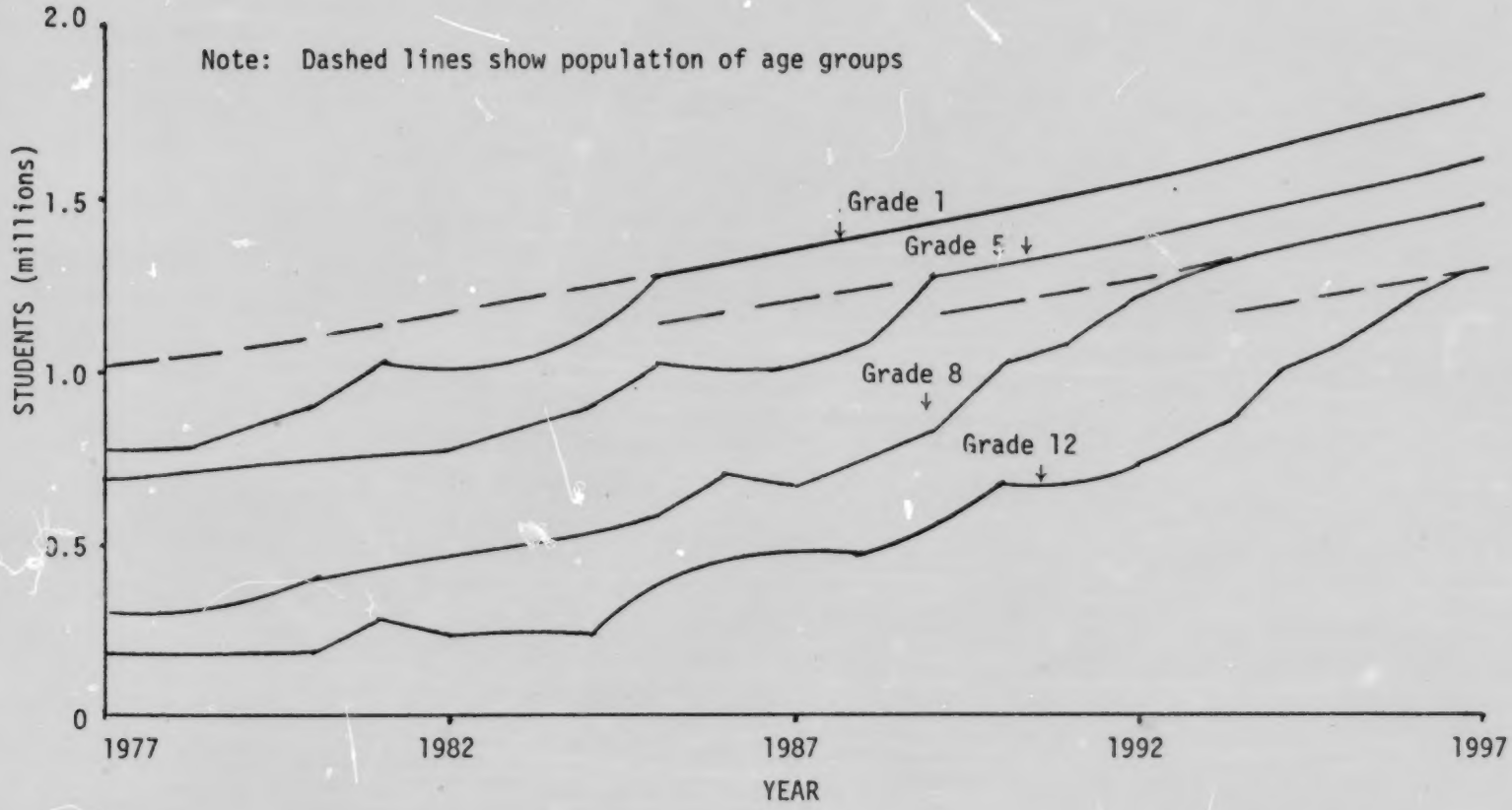


Fig. 6 Student Enrollments: Limited Case with TV.

education. Student-teacher ratios in the elementary and secondary schools are assumed to be 40 in an attempt to match the existing situation in Iran. At the teacher training institutions it is assumed that the teacher training ratio with television is 60:1, and on a conventional basis, 30:1. Ten mentors are assumed assigned to each principal faculty member. In the normal school, and the guidance cycle training center or associate degree program schools, the faculty are assumed to have bachelors degrees. At the university the principal faculty are people with masters and Ph.D. degrees. The mentors in each case are recent graduates of the institutions. Figure 7 compares a conventional teacher training system to the television-based one. These two figures demonstrate that television reduces by four years or more the time of achieve 100 percent enrollment in any given grade level, and to ensure that no one is forced to dropout due to lack of teachers at higher grades. These times are summarized in Table 3.

The effect of television training on staff composition at all three levels, primary guidance cycle and secondary, has been shown in Fig. 2. There is very little difference at the guidance cycle level between the two systems due to the existing highly developed system of training institutions to serve that grade level. Effects can be seen at the primary level and at the secondary level. At the primary level there is about a 15 percent reduction in the number of unqualified staff in comparison to the conventional teacher training system. More dramatic is the high school result, with unqualified staff members constituting only one-third the number with television as compared to the conventional teacher training approach.

Since the television-based training system has enormous capacity, the analysis considered what would happen if more than the 3 percent of 9th graders and 6 percent of the 12th grade or high school graduates are interested in teaching as a profession. The additional trainees would have to come from other activities and be willing to change careers. By assuming that there is a large supply of people willing to become teachers, an idea can be gained of the full potential of a television-based training system. Therefore, computer runs were made with a very large, essentially unconstrained source of trainees. The results in terms of student enrollments at the 1st, 5th, 8th and 12th grade levels are shown in Fig. 8.

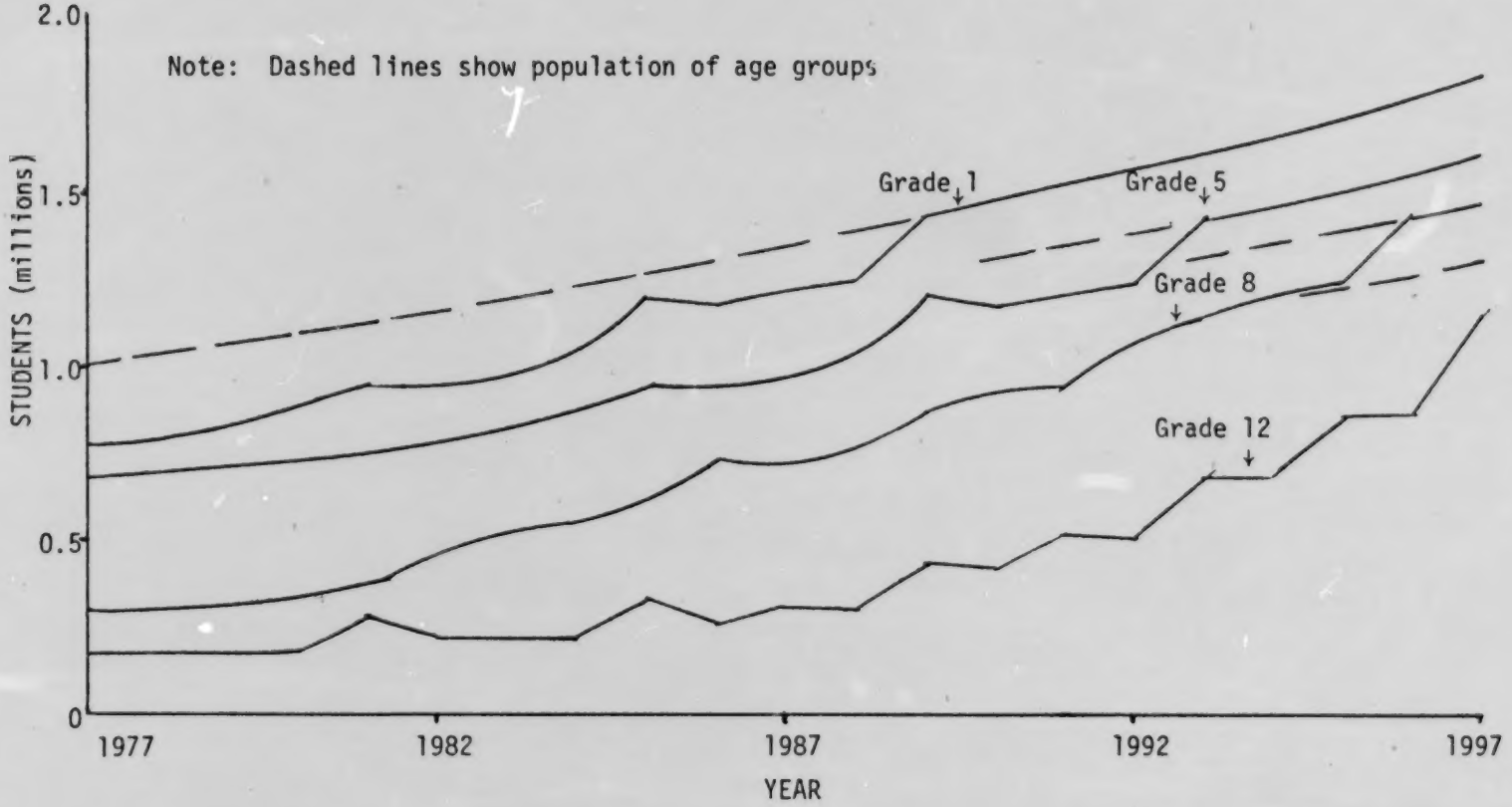


Fig. 7 Student Enrollment: Limited Case, Conventional.

Table 3

The Effect of Television on the Time to Achieve Full Enrollments

Event	Year of Occurence (1977 Start of Program)			
	Unconstrained Case*		Limited Case*	
	With TV	Conventional	With TV	Conventional
100% 1st grade enrollment	1980	1984	1985	1989
100% 5th grade enrollment	1984	1988	1989	1993
All Primary completions accepted in guidance cycle	1980	1984	1992	1992
100% 8th grade enrollment	1987	1991	1994	1996
All Guidance cycle completions accepted in secondary school	1982	1989	1986	1994
100% 12th grade enrollment	1991	1995	1998	2000

*See footnote Table 1

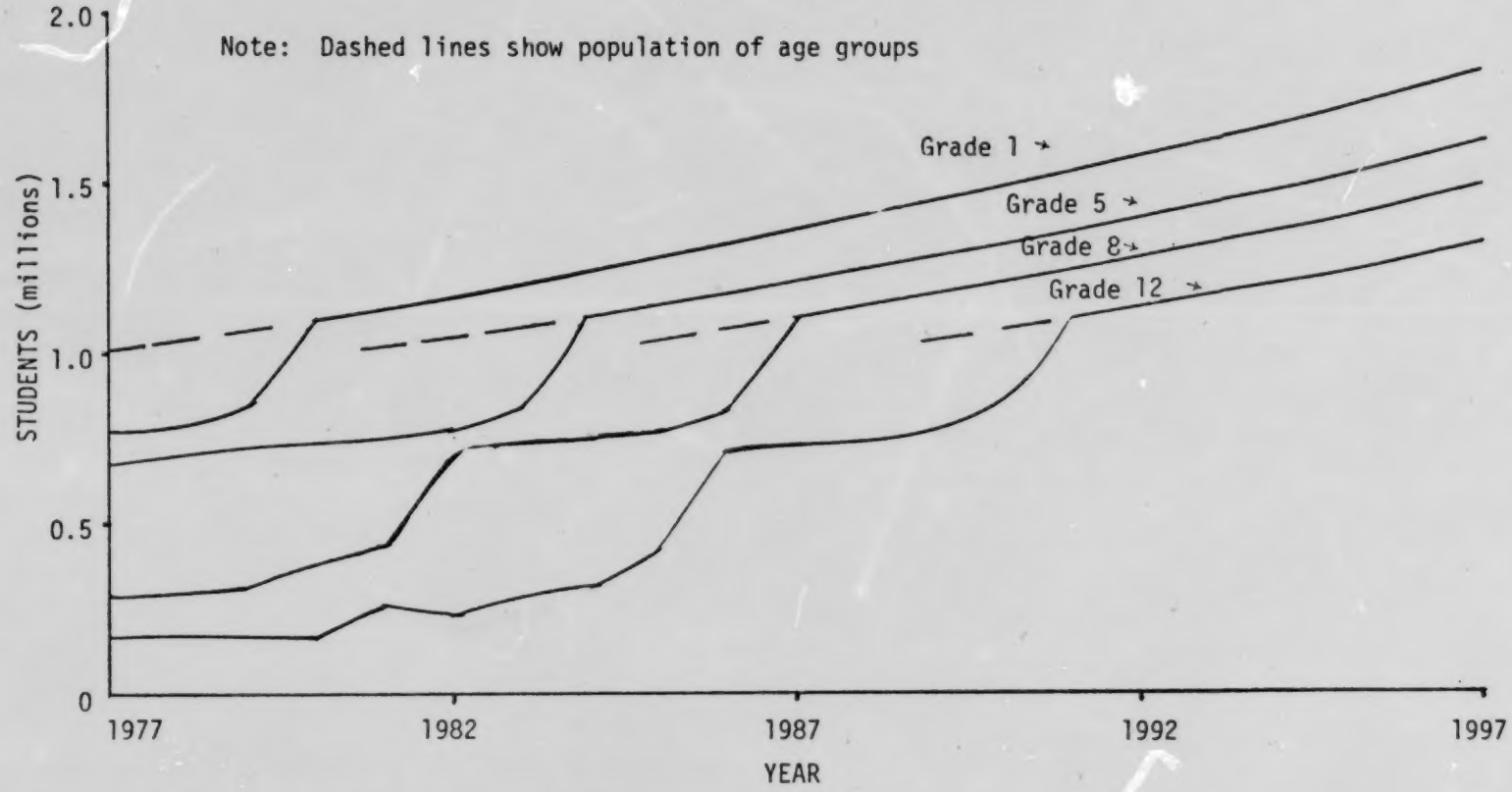


Fig. 8 Student Enrollments: Unconstrained Case with TV.

The corresponding conventional training system results for the unconstrained case are shown in Fig. 9. The conventional system takes on the order of 4 years or more beyond what the television-based system can accomplish in achieving 100 percent enrollments at the various grade levels. Enrollments in the elementary and secondary grades with the conventional teacher training system run on the order of 10 to 20 percent below the enrollment levels for the television-based teacher training system. The impact on the composition of the staff at a point 10 years from the initiation of the teacher training program was shown in Fig. 2. The differences between the two systems are much more dramatic in the unconstrained case. For example, at the primary level, the television based teacher training system is able to provide a sufficient number of people with associate degrees to completely staff the primary grades. By contrast, the conventional system is able to staff only one-fourth of the primary grade teaching positions with associate degree personnel.

At the guidance cycle level both the television-based and conventional teacher training programs are able to fully staff the schools with associate degree personnel. There is a more apparent difference in the total number of teachers who can be trained for the guidance cycle schools with the television-based teacher training system. The most dramatic impact is, again, at the high school level where, with television, it is possible to almost completely staff the high schools in ten years with bachelor degree people. The conventional system results in only about 20 percent of the staff with bachelor degrees, 60 percent with associate degrees and the remainder unqualified.

With the potential of the television-based system the question remains of how to attract additional people into the teaching profession. Table 4 describes the peak training rates for each of the teacher training institutions. If the high school continued to supply 3 percent of its students to each of the teacher training institutions, the remaining numbers needed to achieve the unconstrained model rate of training would be small compared to the number of people with the basic qualifications to enter the institutions. There are presently some 2.5 million people in Iran with high school diplomas who have not gone on for a college education.

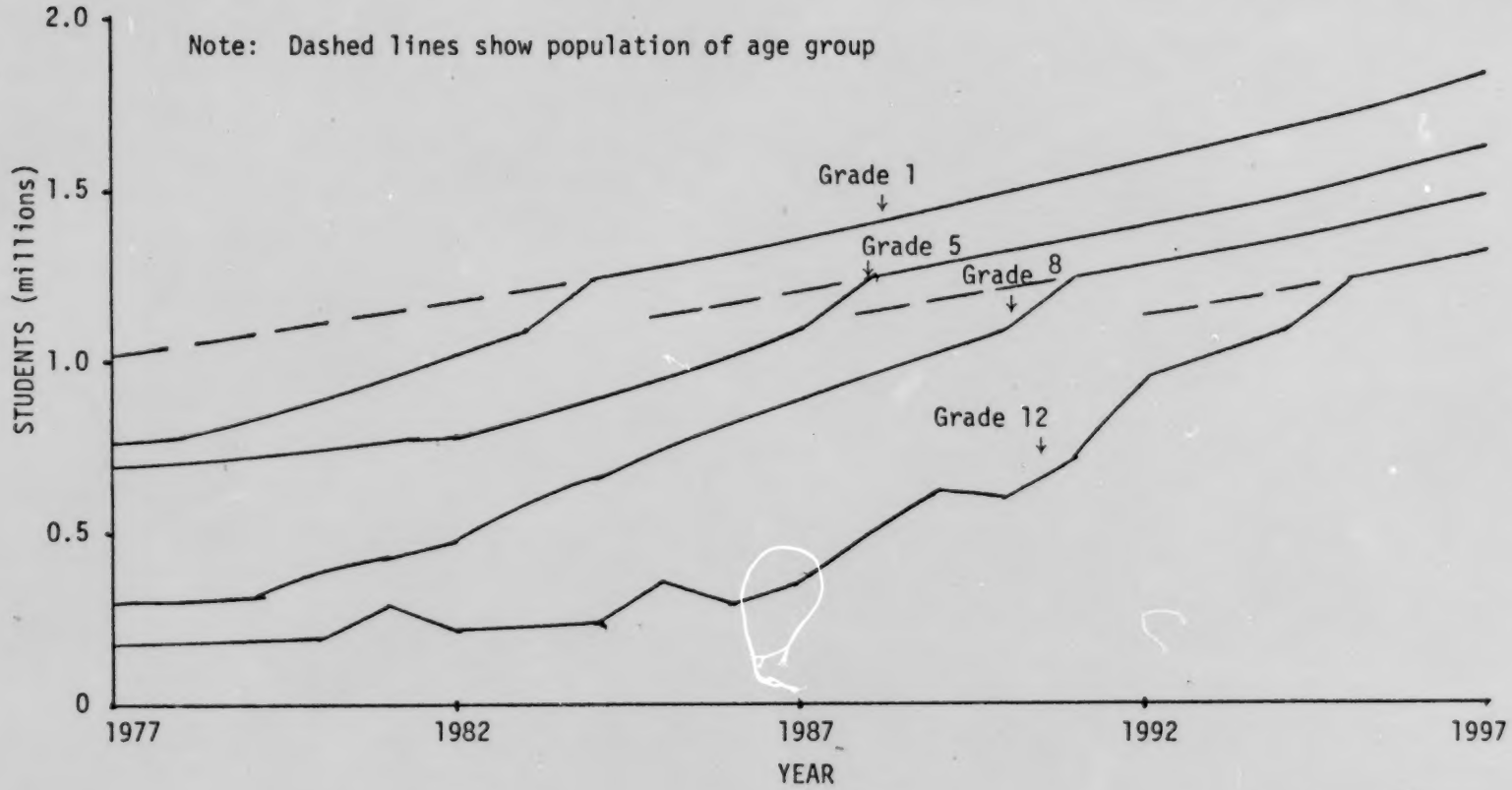


Fig. 9 Student Enrollments: Unconstrained Case, Conventional.

Table 4

Projected Entry Rates into Teacher Training, 1978

Case*	Normal School	Guidance Cycle Training Center (two-yr college)	University
Unconstrained			
With television	19,200**	20,523** (2,923)	15,779
Conventional	5,879	6,830 (2,423)	1,253
Limited			
With television	5,760**	7,887** (2,607)	5,280**
Conventional	5,760**	7,704** (2,424)	1,253

*See footnote Table 1

If only 1 percent of these people were to undertake a mid-career change, benefits similar to the unconstrained case would be achieved. There are about 8 million people qualified to enter the normal schools. Again, it would take on the order of 1 percent to meet the needs for training teachers at the maximum rate possible with televised teacher training programs. It would be extremely important for the Ministry of Education to establish sound incentive programs and good work conditions to assure that a large number of people are attracted into the profession.

Another important issue is the identification of institutions able to administer the television-based programs. At the present time in Iran there is only one institution with a major commitment to the use of television for teacher training and that is the Free University of Iran. In examining the FUI's media plans for 50 centers and 3,000 students total entering each year, it is easy to see that this institution alone would be handling up to half the number of trainees needed, at the university level. If ERTI can help the FUI to expand its television-based activities, introduce television to the Ministry of Education extension programs, and expand university and college-based teacher training programs with television, substantial benefits could be expected.

An important consideration in establishing a major national teacher training program is cost. Estimates were made of the relative salary cost between television-based and conventional teacher training programs. The results are shown in Table 5. Significant results are found at all levels in the education system with the salary costs all significantly lower with the use of television and the number of teachers trained for each level significantly higher. The salary units presented in the table assume a unit level of income per year for the principal instructor. Mentors are assumed to make 80 percent of a principal instructors salary. At the university level, a teacher with a masters degree is assumed to make 20 percent more than the mentor while a Ph.D. makes 50 percent more. The mentor with a bachelor's degree makes a unit salary. These are considered conservative figures. The actual differences between the primary instructional staff and the mentors would probably be greater; even with conservative numbers there are significant cost savings with the use of television. Table 5 shows the cost per trainee with television is on the order

Table 5

Faculty Salary Cost Per Trainee

Normal School	
Bachelor degree, per year	1.0
Mentor, normal school certificate, per year	.8
Guidance Cycle Training Center (GCTC)	
Bachelor degree, per year	1.0
Mentor, associate degree, per year	.8
University	
Ph.D., per year	1.5
Master's degree, per year	1.2
Mentor, bachelor degree, per year	1.0

Cost per trainee with television:

- Normal School and Guidance Cycle Training Ctr.
  - 1 Bachelor degree plus 10 mentors, student-teacher ratio of 60 — .0136
- University
  - 1 Master's degree plus 10 mentors, student-teacher ratio of 60 — .0139
  - 1 Ph.D. plus 10 mentors student-teacher ratio of 60 — .0144

Cost per trainee, conventional:

- Normal School and Guidance Cycle Training Ctr.
  - 1 Bachelor degree per 30 students — .0333
- University
  - 1 Master's degree per 30 students — .0400
  - 1 Ph.D. per 30 students — .0500

Television cost/conventional cost

- Normal School and Guidance Cycle Training Ctr. — .408
- University
  - Master's degree principal instructor — .348
  - Ph.D. principal instructor — .288

of 40 or 50 percent of the cost of conventional teacher training.

Special consideration was given to the role of the associate degree in the effort to meet Iran's education goals. Figure 10 shows the impact in ten years of using associate degree graduates only at the guidance cycle level. There is a slight increase in the total enrollments at the guidance cycle level, but a serious decline in both the total enrollments and the proportion of qualified staff in the high schools. There is a slight reduction in both the total number of enrolled students and the proportion of qualified staff at the primary grade level. These results indicate that the associate degree can be an important component at all three levels, primary, guidance cycle and secondary. Particularly at the high school level, people coming from a well designed program can do much to offset the long growth period involved with the development of a teaching staff with bachelors degrees.

The quality of education in Iran is a major concern. The possibility arises of emphasizing improvements in quality at the expense of quantitative improvements in enrollments at the elementary and secondary levels. It may be quite reasonable to deny education to some people in order to assure that the education that the much larger number receives is at least adequate. Figure 11 shows the results of placing 10 percent of the unqualified teaching staff from each level in the elementary and secondary schools into the appropriate teacher training institution for a complete upgrading of skills. In ten years, there is an important improvement in the credentials of the teaching staff at various grade levels. However, for this situation in which 10 percent of the unqualified staff are sent for retraining each year, the loss in student enrollments at the primary, guidance cycle and secondary levels is so severe as to raise doubts that the gain in staff qualifications and its impact on students will offset the loss.

Teacher dissatisfaction leads to a high loss rate of the qualified people in the profession. This is true in all countries of the world, not just Iran, but is particularly acute for Iran at a time when it must build a fully functioning educational system in a short period of time. Computer runs were made to assess the impact of a 10 percent per year

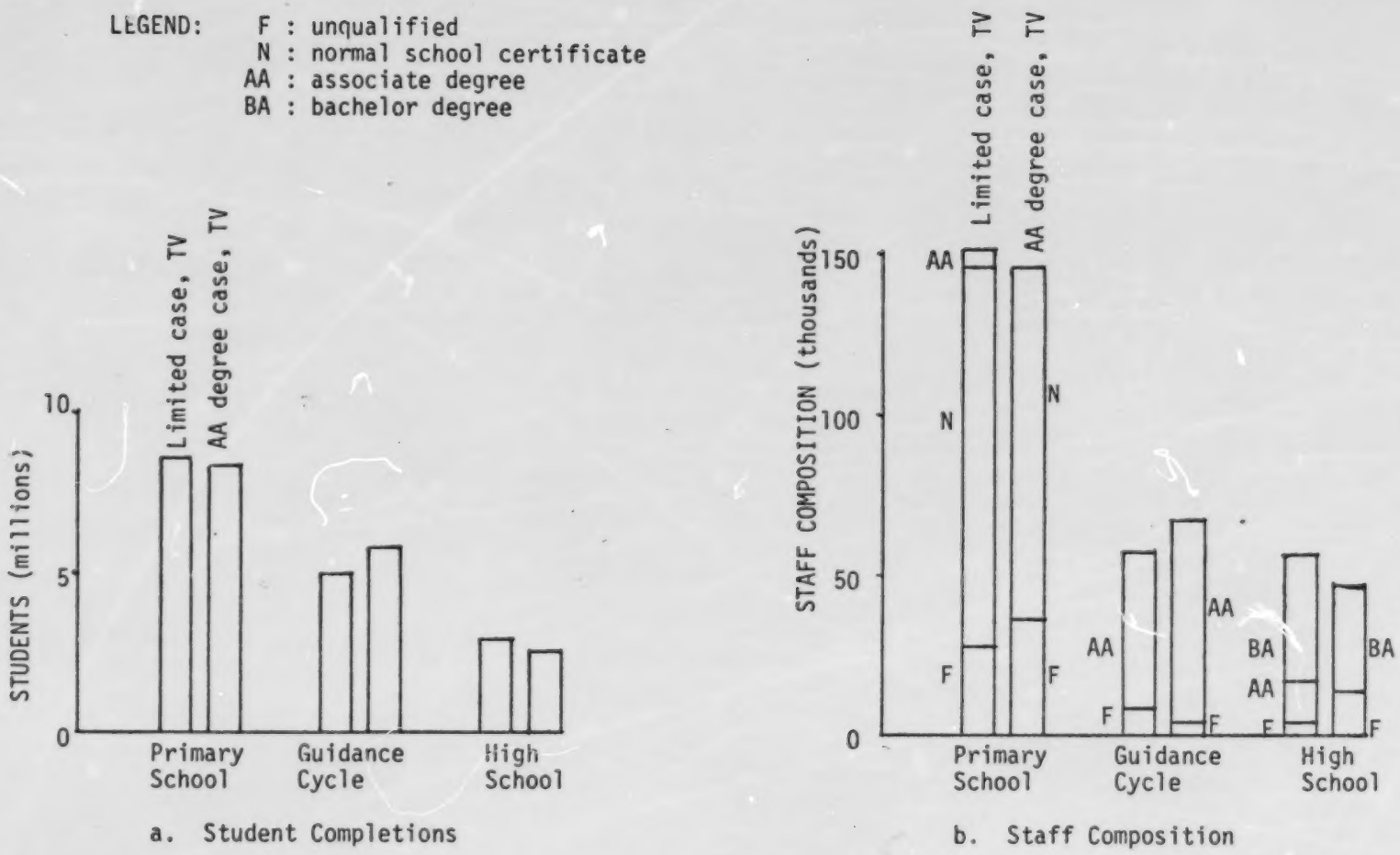


Fig. 10 Effect of Restricting AA Degree to Guidance Cycle Schools.

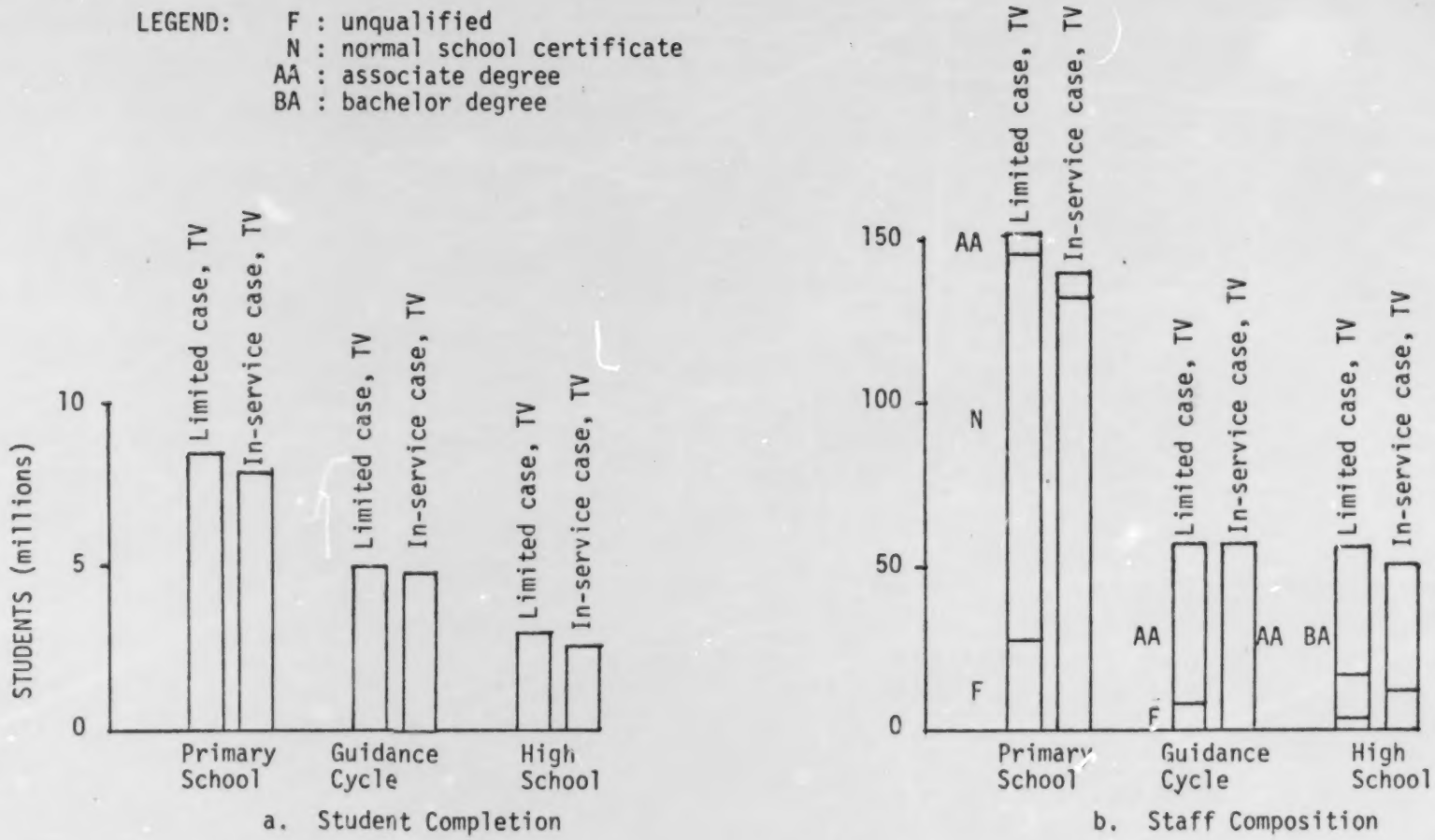


Fig. 11 Effect of Fixed In-Service Training.

resignation rate on the part of teachers at all grade levels. Figure 12 compares 1st grade enrollments for the 3 percent entry rate television case discussed earlier and for the case of 10 percent resignation per year with and without television-based training systems. The advantages of television are apparent in this situation. While it is impossible, even with television, to keep up with the high loss rate, the enrollments with television are half again as high as those without. There are two main conclusions that can be drawn from these results. First, it is imperative that Iran provide the incentives and working conditions to keep the teachers that are trained. The best training system will not be able to keep up with a high loss rate. The second point is that television offers important benefits in times of crisis for an educational system. Bad situations and bad conditions can be minimized in their impact on the total educational system when television is used for the teacher training programs.

A final consideration is the effect of a realistic drop-out rate among the elementary and secondary students on the need for teachers. The nominal 3 percent entry case, using television for teacher training, was run on the computer with a drop-out rate developed from U.S. statistics. It is considered reasonable for Iran's student population to achieve a similar profile in terms of completion rates at different grade levels. The U.S. data are from the early 1970s and are considered representative of a developed nation. Iran cannot be expected to exceed these values and probably will not approach them for quite some time. The data shown in Table 6 indicates that the reduced need for teachers at the higher grade levels results in earlier achievement of the goal of 100 percent enrollments at the lower grade levels and permits the more rapid improvement of teacher qualifications at the lower grade levels. Therefore, the results discussed earlier from the other computer runs in which no student drop-outs were assumed can be considered conservative.

F. CONCLUSION

The major findings from this study indicate the potential value of using television to train teachers in Iran. It could be an important factor in achieving educational goals critical for the nation's development.

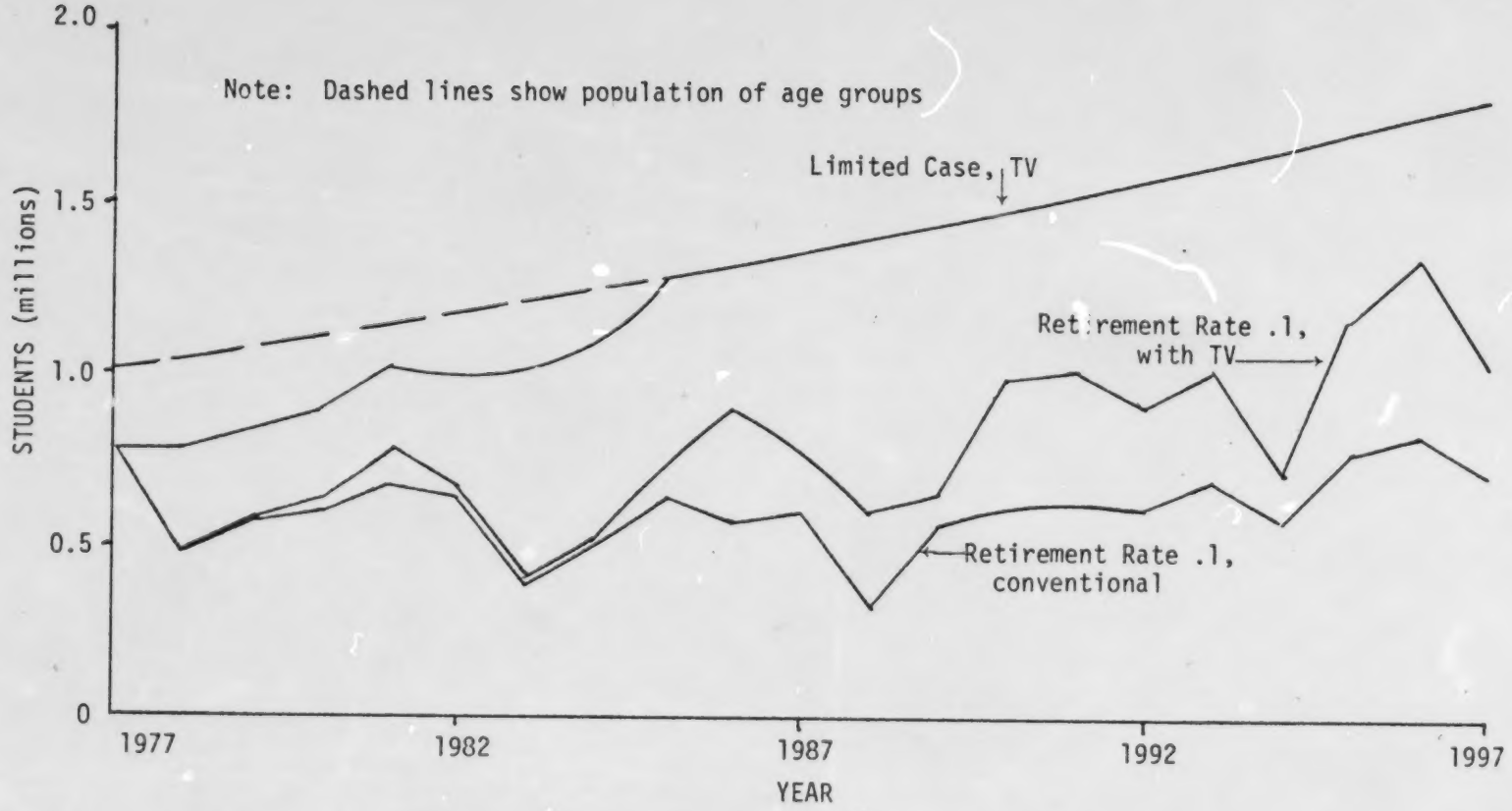


Fig. 12 Effect of Large Teacher Retirement Rate.

Table 6

Student Drop-out Rates and Effects

a. Assumed drop-out rates:

Grade	Number of Students Continuing in each grade	Proportion Continuing from Grade	
1	1,000		
2	1,000	1 to 2	1.000
3	1,000	2 to 3	1.000
4	1.000	3 to 4	1.000
5	1,000	4 to 5	1.000
6	990	5 to 6	.990
7	983	6 to 7	.993
8	976	7 to 8	.993
9	963	8 to 9	.987
10	931	9 to 10	.967
11	863	10 to 11	.927
12	793	11 to 12	.919
High School Graduates	752	Graduates	.948

b. Effect on school completions:

Case*	Cumulative Total of Completions over Ten Years (1977-1987) (in millions)		
	Primary	Guidance Cycle	Secondary School
Limited entry with television	8.53	4.93	2.95
Same with drop-out	8.57	4.74	2.47

*See footnote, Table 1

ERTI should carefully assess where and how it can most influence teacher training and apply the concepts presented here.

Appendix A is taken from Volume 1 of Technical Report No. 2, Program Planning Assistance, Communication Satellite Planning Center, Stanford University. Appendix B is from the same source.

APPENDIX A

Successful Applications of Educational Television (ETV)

A. APPLICATIONS OF ETV

This section presents a brief overview of how ETV has been successfully used in a range of applications at the elementary, secondary and postsecondary levels. These applications are examined from the perspective of efficiency in reaching large numbers of students.

Elementary and Secondary examples include:

- Washington County (Hagerstown), Maryland. This system has been in operation for 21 years and broadcasts 41 courses weekly to elementary and secondary schools with a total enrollment of 23,000 [1].

- Anaheim, California has had an ETV system in operation for 18 years. The school district is providing 144 separate programs per week. For students in kindergarten through 8th grade, 12 to 20 percent of their class time is spent with ETV [2].

- Santa Ana, California has been operating an ETV system for 14 years. It provides broadcasts for over 31,000 students at every grade level in elementary and secondary schools. In 1972 there were 133 telecasts per week to elementary schools alone [3].

Post Secondary examples include:

- Stanford University, the University of South Carolina, Case Western Reserve University, Colorado State University, Cornell University and the University of Florida, among others, have successfully provided graduate and post graduate courses via ETV to off-campus industrial locations [7].

- The British Open University and the Bavarian Telekolleg are examples of successful programs based on providing college level material through televised lessons [8, 9].

- ETV has been used for continuing and medical education of physicians in the Soviet Union [6].

- Teacher training via ETV has apparently been successful in Algeria, Colombia, New Zealand and elsewhere [10].

- Adult literacy and education has been dealt with in Niger and Italy using ETV [10].

The effectiveness of ETV in these various applications has been examined in a number of surveys and evaluations. Comprehensive assessments by Chu and Schramm [11], Reid and McLennan [12], and Jamison, Suppes and Wells [13] all agree on one main point: ETV, when properly used, is as good or better than conventional instruction. However, in assessing the ETV uses which will potentially provide the most benefit to Iran, it is necessary to determine which are most related to Iran's need for a rapid increase in skilled manpower. Therefore, the following considerations are noted:

- Results from Anaheim and Santa Ana ETV use are representative of the elementary level. They show a one-third increase in the number of students that each regular teacher could teach. The savings were achieved by combining large classes. For Iran this is not appropriate for half its population, considering the low rural population densities and small class sizes.

  The increase in students per teacher is estimated as follows: In Anaheim and Santa Ana the fifth and sixth grades spend half a day in their homerooms with one teacher for each 25 students. The other half of the day is spent in an "audio-visual resource room" with four classes totalling 100 students directed by two teachers and a teacher's aide. The two grade levels share the same teachers and classrooms. When one grade is in the resource room, the other grade is using the individual classrooms. They exchange places halfway through the day. Therefore, six teachers and one aide handle 200 students. Counting only the regular teachers, the student-teacher ratio increases by one-third to 33.3.

- On the other hand, Chicago TV College experienced a 400 percent increase in the number of students handled by one teacher in an ETV Child Development class and Coast Community College District cited one case where a single instructor managed an enrollment of 600 ETV students in a televised psychology course.

- In addition to increasing the number of students per instructor, the issue of reaching off-campus locations is important. Colorado State University, for example, reached 1,450 students in 31 off-campus locations during 1973-74, an enrollment which was larger than that on-campus. Similarly, Southern Western University reached 635 students off-campus in seven remote sites in comparison to the 665 students enrolled in undergraduate and graduate courses.

In view of Iran's need for a rapid increase in the numbers of teachers, the issue of how ETV can most efficiently meet this goal is crucial. Since the increase in the number of students per teacher with ETV is less at the elementary than the adult level, i.e., 14-15 percent vs. up to 400 percent, the use of ETV to deliver lecture material to the teachers rather than the children should be emphasized.

B. CASE STUDY ANALYSES

This section describes the functional application of ETV in seven educational systems within the United States and Great Britain. In each case, the objective of ETV use is noted and variations among the system are described in terms of:

- Qualifications of the instructional staff.
- Efficiency of ETV in increasing the number of students per principal instructor.
- Accessibility of education via ETV to those unable to attend traditional institutions.
- Effectiveness of ETV use in meeting the stated goal.

Quantitative data of the type needed for this analysis was either imprecise or lacking in recently-published literature. Therefore, the information gathering was accomplished by telephone interviews and, in two cases, by on-site visits.

1. Chicago TV College

An extension of the state and locally-supported Community College District of Chicago's (Illinois) seven campuses, the TV College was started in 1956 with the intent of bringing the opportunity for postsecondary education leading to an AA degree to those who were unable to receive it in the traditional manner [14]. The course offerings, which included teacher training and renewal courses, have since been expanded to include electives and, more recently, vocational courses. The latter is a result of a legislative mandate which allows the community colleges to depart from purely academic instruction in order to include vocational training in such subjects as secretarial skills, and business law. The college rents space for production and delivery from station WTTW, an open circuit educational television station.

Students registering for a course from the TV College have the option of taking it on one of the District's campuses or at an off-campus site (e.g., home, penal institutions, etc.). Of the 2,300 enrolled during the spring 1975 quarter, approximately 70-80 percent were off-campus viewers having no contact with community college activities. A summary of the Chicago case study is presented in Appendix 3A, Table 3A-1 (page I-107) while the major variations are described below.

a. Qualifications

Although approximately 60 percent of the TV College instructors hold a Ph.D. degree, a major criterion for selecting the ETV instructor is ability to effectively present the course over television. Thus, instructors at the Bachelor's or Master's degree level may serve as principal instructor in contrast to the more traditional reliance on Ph.D's.

In the Chicago case, strict teacher union regulations stipulate that a qualified instructor must be the primary contact for the student and therefore the use of teaching assistants is precluded. Either the principal instructor handles an entire ETV course enrollment, or individual sections are managed by an instructor with at least a BA/BS degree.

b. Efficiency

Again, due to union regulations, an instructor on one of the District's seven campuses is limited to a total of 140 students per semester and 15 hours of instruction per week [15]. However, special union rules apply to the television instructors. Thus, in the example of a Child Development course, the ETV instructor handled a total enrollment of 550, an increase of 400 percent. This capability for increasing the number of students per principal instructor can, in this case, be attributed to a number of factors:

- Only 20 percent of the students enrolled in Child Development attended the optional teacher-student conferences at the city's three learning centers. This is the average number of students enrolled in any of the TV College's courses who seek out active involvement with the instructors [15].

- Similarly, only 20 percent of the students used telephone conferencing time. Since the majority of these questions concerned process (e.g., exams, due dates, repeat course performances, etc.) rather than content, an informed member of the clerical staff could have responded [15].

- The TV instructor developed the course so that prolonged preparation time on a weekly basis was eliminated.

A second example serves to underscore the ability of ETV to increase the number of students handled by a single teacher. With a Spanish course that normally constituted half of her teaching load for the semester, the instructor had an enrollment of 210. Normally limited to 70 students in the traditional classroom for each of her two courses, she dealt with a 300 percent increase.

It is noted that students were required to meet with the teacher for seven recitation sessions in the learning centers. Thus, the instructor's involvement per student here was higher than for the 20 percent in the Child Development course where conferences were optional.

c. Accessibility

Several examples can be cited which demonstrate how the TV College extends the opportunity for postsecondary education to people who would otherwise be unable to receive it. These include:

- Studies Unlimited: A self-paced learning program administered by Learning Advisors in the public library system whereby a student views the course on tape, takes the exams, and completes assignments with no involvement with an instructor. This program serves the needs of those who cannot view the broadcast at the time it is offered, or who cannot maintain the pace of the course.

- Penal Institutions: A program whereby the course is administered by correctional officers and the TV instructor visits the prisoner/students once or twice a semester for lecture and discussion sessions.

- Gifted High School Students: A program whereby students combine TV instruction with credit earned in college exemption tests enabling them to earn up to a year's college credit while still in high school.

- Physically Handicapped and Hospitalized: A program whereby the course is administered by ministers, social workers and others working part-time. The college grades exams and performs other academic and administrative functions.

- U.S. Army Air Force and Army Servicemen in Germany: A course in Data Processing.

d. Effectiveness

The Dean of the TV College emphasizes that TV instruction alone cannot carry the entire teaching burden, and that it must be supplemented by printed study aids and text books. He also notes that face-to-face instructional activities are desirable. With the Studies Unlimited program, the students have not done as well as the average, for example. On the other hand, while only 20 percent of the TV students sought contact with the Child Development course instructor, the average retention rate was equal to that of the District's traditional community college classrooms (i.e., 65 percent), which is an indicator of the possible success of ETV courses.

In various evaluation-type studies undertaken by the TV College, results which have planning implications include:

- In addressing the quality-of-production question, the TV College imported a course costing approximately 10 times

that of its own courses. Students enrolled in both were asked to compare and rate the two presentations. The results were mixed, with 75 percent of the responses giving a version of the following answer: "Give us a bit of both. Alternate the two types of presentation formats, either within a single program, or between programs in a series" [16].

- During the early years, the College imported nationally-recognized scholars to design and present ETV courses. In general, this was unsuccessful because local instructors were more familiar with styles, interests, and the academic needs of local student population.

- In the third year of operation, a study indicated that TV students generally fared better than their in-class counterparts [17]. While this may be attributable to maturity and motivation of the TV students, it is another indication of success.

A summary of indicators used to analyze the efficiency and effectiveness of the Chicago TV College and the results of that analysis are presented in Table A-2.

2. Coast Community College District

Coast Community College District, consisting of Orange Coast College and Golden West College, has been offering community college courses for credit since the spring semester of 1973. With the objective of bringing high quality ETV postsecondary instruction, the District owns and operates its own PBS-affiliated broadcasting station, KOCE, reaching not only the District's population of 450,000 but also another one million residents of Orange County, California [18].

Course offerings consist of introductory-type academic classes such as anthropology and psychology, and others of more general interest,

such as free-hand sketching and vocation courses such as sewing. These courses are either produced at KOCE or imported from other educational institutions striving for the same high quality ETV material. The instructional packages accompanying the TV course include textbooks, study guides, and other supportive material designed to be sufficient for the student who cannot or will not seek consultation with the on-campus instructor. The District also exports their courses to other academic institutions. A summary of this case study is given in Table 3A-3 (see Appendix A).

a. Qualifications

In the Coast Community College District case, a differentiation is made between the ETV instructor and the instructors in the user-colleges. With high quality production as a key concern, the ETV instructor may or may not be an academic person. An actor may use material developed by the principal instructor to insure effectiveness of the TV presentation. In the two-year community colleges, the principal instructor is likely to hold either a Master's or Ph.D. degree, and in the four-year colleges and universities, a Ph.D.

Since the District designs courses for minimum reliance on the instructor, each academic user-institution has a choice on such issues as how, or if, student/instructor interaction will take place, or if teaching assistants or mentors will be used.

b. Efficiency

Given the various ways that a user institution may choose to use the District's ETV material, a number of examples can be presented to document the efficiency of their ETV courses. With the psychology course, for example, one instructor handled 600 students, representing a factor of 20 increase over the 30:1 ratio. This was accomplished with the support of a large clerical staff and computerized grading systems. On the other hand, another user institution with a total enrollment of 600 in the psychology course chose to divide the group into four sections of 150 students with four MA or Ph.D. instructors per section and with the principal instructor overseeing the program.

Another example is free-hand sketching, where two instructors handled an enrollment of 600 in one college, while another college chose to allocate the 600 students among four instructors. In the first case there was, therefore, a factor of 10 increase in the number of students handled by a single instructor and in the second case, a factor of five increase. In both situations there was a noncredentialed review staff who were trained to use predetermined formulas to grade and comment on the student's progress.

In the two District colleges, student interaction with the college is enhanced by a 24-hour recorded answering device on the telephone. Either the instructor or clerical staff returns calls, depending on whether the question is content- or process-oriented. (As with the Chicago TV College experience, the majority of calls are process-oriented.) In addition, the instructor schedules a minimum of two to three hours a week for telephone conferencing.

It is emphasized that the Coast Community College District's courses are packaged in such a way that the course can run the instructor, or vice versa. That is, the package is sufficiently self-contained that one user institution may choose to rely totally on it, with face-to-face contact occurring mainly during midterm and final exams, while another might choose to supplement the ETV with discussion and recitation sessions twice a week. Even in the latter case, the course's package contains discussion outlines so that further information is not necessarily required [18].

c. Accessibility

Of the TV student enrollment sampled following the spring 1974 quarter, 66 percent indicated that they enrolled in TV courses rather than traditional for convenience reasons. Of these, 50 percent indicated that there were reasons why they could not attend on-campus classes. Included in the student population surveyed were 38 percent who indicated they were housewives, and an additional 45 percent were currently employed. Thus, it would seem that the District is reaching students who

desire postsecondary education but would not be able to attain it in the traditional setting. Indicators of the efficiency of the Coast Community College District's ETV courses are shown in Table 3A-4.

d. Effectiveness

The District attempted to evaluate the effectiveness of their ETV courses by soliciting student response both during and after its delivery [19]. The following are some results of that study:

- The overall completion rate, based on whether or not the student took the final exam, was 37.6 percent. However, since only 44 percent of the total enrollment indicated that credit towards a degree was the prime motivation for enrolling, the relatively low completion rate may be less significant. Thirty-four percent indicated that they were motivated by "general interest," 16 percent by "desire to advance professionally," and six percent by "other" motivation.

- Of the students who participated in the evaluation study by completing course diaries and questionnaires, 75 percent completed the course, which would indicate that some type of active involvement with the course in addition to course-work is desirable.

- Of the exam takers, 73 percent indicated that the TV course provided direct assistance to them, 90 percent indicated that they would recommend the course to others, and 91 percent replied that they would enroll in another TV course. Comparable figures for nontakers are 56, 86, and 89 percent respectively.

- Nearly all of the 73 students who completed a face-to-face interview endorsed the concept of a course facilitator

on campus. However, less than 16 percent indicated that they had done so, and less than two percent of the entire spring TV student sample indicated that they had maintained frequent contact.

3. Outreach Consortium

The Outreach Consortium is comprised of 18 institutions of higher education in Orange and San Diego counties, California. It was formed in 1971 with funding from the Postsecondary Commission of California with the mandate to examine the state-of-the-art and potential for developing and offering broadcast courses. In developing this model consortium, research was carred out to determine what courses could be developed and offered by the member institutions to provide increased educational opportunities for the students in their service areas.

The first course, Contemporary California Issues, which addresses topics of current concern (poverty, crime and criminal justice, drug abuse, resources and energy, pollution, aging, racism, sexism and education) will be released in September 1975, and hence little can be said currently about course delivery. However, it is noted that Golden West College and Coast Community College, two of the 18 consortium members, are anticipating an enrollment of 6,700 or approximately 3,350 per campus. Current plans call for 1,000-plus students per class. In addition, the University of California at Irvine is intending to offer the course this fall and supplement it with lectures every other week by experts in the subject matter. This case study is summarized in Table 3A-5.

4. Stanford University's Engineering Telecourse

Stanford University has been offering post graduate engineering courses leading to MS, Engineer, or Ph.D. degrees over the Stanford Instructional Television Network to employees in the San Francisco Bay Area firms since 1969. These courses are offered to three types of students in 37 participating industries: (1) the Honors Cooperative Program (HCP) students who are enrolled for credit, (2) the nonregistered-option students

who are not matriculated at Stanford but are tested and graded and have the option of matriculating and transfering credits earned if a course is successfully completed, and (3) auditing students who attend courses for a reduced fee but are not tested or graded.

The format of instruction is lecture in studio-classrooms, with on-campus students in attendance, telecast live with two-way audio feedback between the instructor and the on- and off-campus students. This case study is summarized in Table 3A-6.

a. Qualifications

The majority of television instructors are Ph.D.'s, with teaching assistants at the Bachelor level or higher used in the traditional capacity and not employed for the TV students per se [20]. An exception occurs when the TV course has been sent on videotape for showing outside of the university's network range. In this situation, one or two tutors at the industry site are selected by the Stanford instructor on the basis of having qualifications equivalent to a Stanford teaching assistant.

b. Efficiency

The efficiency question is straightforward in this case. As noted in Table 3A-7, the off-campus enrollments have grown from 154 in 1968-69 to 2,008 in 1973-74, with 150 engineering courses offered.

Communication aside form the direct audio feedback is maintained by a courier who delivers supplementary lecture notes and readings to the off-campus sites and returns exams and other assignments to Stanford. In addition, the HCP students have the option of conferring with the instructors although, in fact, very few do so [20]. They can also use campus facilities.

One point to be raised in assessing efficiency is the fact that since the instruction is live, the problem of updating existing ETV material is eliminated. Another issue relates to efficiency from the university's point of view. In Stanford's case, the full cost of educating the HCP students is effectively paid for by fees from the user companies. These funds were transferred to the departments where the students were

studying which made it possible for the School of Engineering to hire 20 additional professors [21]. In the network manager's opinion, no additional instructor costs should be assigned to the ETV students because the audience for existing programs is merely expanded [20]; if viewed from this perspective, the university experienced a significant gain.

c. Accessibility

Since the expressed purpose of this program is to extent the opportunity for post graduate engineering courses to employed individuals in off-campus sites, the efficiency of meeting this goal is also straightforward. As noted in Table 3A-7, the number of remote sites has grown from 18 in 1968-69 to 36 in 1973-74.

In examining efficiency from the perspective of value to the remote sites, two types of savings are used as indicators: savings in student time, and savings in cost. In the first instance, savings can be calculated in terms of commute time which has been estimated as up to three hours of commute per class hour. In terms of cost, if the student uses these three hours in commute time, the employer might have the added cost of hiring additional manpower. Even if the employee-student pays his own way in the sense of becoming a part-time worker, the overhead cost of two people working half-time is greater than for one person full-time [22].

Two less tangible effects of off-campus study include (1) the motivation for other workers to review their basic education, provided by observing the student studying at the work site, and (2) the ability of participating companies to attract qualified employees by offering them the opportunity for postgraduate study [22].

A summary of indicators of the effectiveness of Stanford's ETV courses is given in Table 3A-7.

d. Effectiveness

One indicator of effectiveness of Stanford's program is the fact that 1,500, or 50 percent of those enrolled in the HCP program have received graduate degrees. Another indicator is the industry participation, which had increased 100 percent, from 18 to 36 users since 1969.

Finally, the fact that several existing videotape courses are now exported to Japan and to Hewlett-Packard in San Diego and Santa Rosa, California, attests to industry's perception of the effectiveness of the Stanford ETV courses.

5. Association for Continuing Education

In late 1969, it became apparent that the Stanford Instructional Television Network could be used to further serve the needs for postsecondary training of employees in the Bay Area's industries. The programming offered, with 77 percent in live transmission similar to the Stanford Engineering telecourses, includes: an MBA program through Golden State University, the Foundation Program for the MBA degree through the College of Notre Dame, a program for the MS degree in Cybernetics Systems Engineering through San Jose State College, and a number of special courses designed to meet specific education or training requirements of member firms.

The classes are offered at times when Stanford Engineering courses are not scheduled -- i.e., in the early morning, at noon, and in the early evening. This case study is summarized in Table 3A-8.

a. Qualifications

The instructors who appear on the live ETV programs range from MA's, MS's, and Ph.D.'s from educational institutions to off-campus experts drawn from Bay Area high technology government, and industrial laboratories and from consulting organizations. Teaching assistants, as such, are not used [23].

b. Efficiency

The Association sets a limit of 40 students per instructor in courses telecast live so that increase in the number of students per principal instructor is not an issue here. What is significant is the fact that the instructors are frequently regarded as part-time, serving as adjunct faculty with no full-time role at the college or university. In this sense, an expert from a consulting firm, for example, can be viewed as extending the teaching resources of the community, which is an efficient means of increasing the instructional pool and sharing the experience of a skilled working force with the students.

c. Accessibility

The mandate of the Association for Continuing Education is to meet the specified needs of the industrial sector by making education accessible to their employees. One example is a course designed for geologists at the Standard Oil Company who requested a course in Global Techtonics. The course was comprised of 20 state-of-the-art lectures prepared by an expert in the subject from the School of Earth Sciences at Stanford University. Standard Oil videotaped this lecture series, and later distributed the program to geologists around the country and the world. In the 12-months period following the live telecast, over 700 geologists viewed these lectures [24].

Other examples of upgrading employee skills include the MBA program, effective business writing, which is designed to acquaint clerical help with technical language, and the Government Contracts Administration course [23].

d. Effectiveness

While the above example indicates how Standard Oil viewed the effectiveness of the Association's programming, another indicator is an increase of 74 percent in total enrollments and of 100 percent in industry users over a five-year period. Indicators of the efficiency and effectiveness of the Association's ETV courses are presented in Table 3A-9.

6. Oregon State University

Oregon State University began experimenting with various forms of televised instruction in 1954, with its first course offered over the state educational television network in 1957. At that time, a primary consideration was the rapidly expanding student population leading to overcrowded classroom facilities and large class sizes. In 1966, the university entered into a contractual agreement with the Corvalis Cable Company to provide at least 18 hours of instructional programming a week in exchange for exclusive use of Cable Channel 5 and no annual charges. Since 1967, an average of 30 to 45 hours of instructional programming have been presented each week, 95 percent of which is on videotape.

In addition to courses and traditional academic subjects such as psychology, biology, economics, and mathematics, short courses in computer programming, library orientation, and subjects of general community interest are presented. These courses are also telecast over the university's closed circuit TV network along with other films in the "special interest" category. The primary emphasis in all course and special interest offerings is to provide the faculty with ETV material which will enhance their instructional ability.

Oregon State University's use of ETV is summarized in Table 3A-10.

a. Qualifications

The university's ETV course instructor is most likely a Ph.D., although occasionally a recognized authority may be used in one of the course segments. Generally one student section for an ETV course is handled by the TV instructor and the other sections are under the direction of a teaching assistant or advanced undergraduate [25].

b. Efficiency

With the high percentage of teaching assistants used for student sections noted above, the extended ability of one principal instructor is clear. In one example of a biology telecourse, where the course enrollment was 700, the TV instruction was presented three times a week supplemented with a one-hour laboratory session and one-hour of recitation. In this instance, the TV instructor had his own section of students, and visited each teaching assistant's section once during the quarter. A student/instructor-teaching assistant ratio of 30:1 was maintained.

c. Accessibility

With the university being primarily faculty-oriented in the sense of meeting the needs of its own teaching staff, a number of examples can be cited for how the accessibility of ETV enhances the instructor's course presentation. It is noted that these present a departure from the previously-documented case studies in the sense that the

students are registered at the university and are not an off-campus group (e.g., prisoners, handicapped, etc.). Examples of special applications include:

- Faculty self-evaluation by videotape recording, either in a private taping session or taped in class.
- Videotaping of TV lesson-demonstrations when it is difficult or expensive to continuously repeat a live laboratory experiment, for example.
- Videotaping of lectures by guest experts for use in future classes.
- Use of videotapes from other institutions.
- Videotaping of a class when the instructor plans to be absent from the campus.
- Videotaping of review and testing materials for student use prior to final exams.

In addition to the above, it is noted that the Speech and Communications Department uses Cable Channel 11 as a community training laboratory for student broadcast trainees. In 1973, these students produced about 120 hours of community programs involving local newscasts, public affairs, and campus entertainment, and an additional 45 hours of live sports cablecasts. The operations of Channel 11 are not further pursued in this case study.

d. Effectiveness

The measures for effectiveness in this case are less easily quantified than in the previous discussions. One positive indication of the university's success in meeting its goal to reach a large student population and to reduce class size is the fact that of 8,500 students

enrolled in ETV courses each year, 70 percent view these off-campus, and on-campus sessions are held to a 30:1 student-instructor and/or teaching assistant ratio. Another positive indicator is the acceptance by the faculty of ETV, a point supported by the number of special applications demanded by the instructional staff and supplied by the ETV production staff.

Indicators of the efficiency and effectiveness of Oregon State University's ETV courses and special applications are given in Table 3A-11. In addition, there are the less tangible benefits of extending the experience of an expert via videotape to more than one class and the savings incurred by not repeating an expensive laboratory experiment, for example. There is insufficient data at this time to quantitatively measure these effects.

7. British Open University (BOU)

In operation since January 1971, the Open University is an exception to the other case studies in the sense that ETV comprises only a small part of a mixed media instructional package which also relies heavily on audio instruction, textbooks, self-assessment tests, student/tutor interaction, student/counselor interaction, and other supportive strategies. Recent estimates are that of the 15-17 hours per week that a student spends in coursework, between 2.5 and 2.8 percent is devoted to watching the ETV program [26]. However, since the planning and design team for courses is comprised of faculty, the ETV staff and others, with the entire team required to approve each component, the ETV side of it is obviously considered important and will be viewed as such for the purposes of this discussion.

In total, some 37.5 hours per wee of ETV material are supplied over the nationally-owned BBC in the schools of Technology, Mathematics, Science, Education, Social Science and Humanities. This case study is summarized in Table 3A-12.

a. Qualifications

The academic qualifications of the Open University's instructors range from a BS/BA with recognized authority in the subject

matter to a Ph.D. It is noted that this range of degrees is possible in Great Britain where less emphasis is placed on the importance of the Ph.D. per se [27] than in the United States. The part time tutors and counselors are mainly drawn from the instructional staff of traditional educational institutions and hold at least a Bachelor's degree. The same holds true for the full time tutors.

b. Efficiency

Interaction between the students and the instructional staff is unique in this case. The academic staff, totaling approximately 400 is allocated between the campus at Walton Hall and the 13 regions, 10 of which are in England and one each in Scotland, Northern Ireland, and Wales [28,29]. In addition, there are full time staff tutors and senior counselors in each regional office who are responsible for recruiting and training the part time tutors and counselors, the student's primary face-to-face contact with the university. As of 1973 there were some 5,100 part time tutoring and counseling posts filled by 4,600 people. The stated goal is for one tutor/counselor to handle a maximum of 12 foundation-level students, and for higher-level students, one tutor and one counselor per 20 students [29]. With regard to the higher-level students, the intent is to reduce the tutor and counselor load to a maximum of 16 students by 1976 [29].

With such an intricate educational system, it is difficult to represent the role of ETV in quantitative terms. The Institute of Educational Technology, the Open University's research arm, is currently engaged in a research project to evaluate the use of radio and television [29]. Even with the present data, however, it is clear that the Open University is moving away from high student-tutor ratios, which are important for the rapid expansion of training in Iran.

c. Accessibility

Virtually all of the ETV material produced to date has been prepared to support specific units in a course. This ETV material can serve three learning functions: (1) demonstrations of instruction, (2) description of case study material, and (3) presentation of imaginative

insight. The science faculty, for example, uses ETV to present demonstration of the practical aspects of the course work, while the arts faculty concentrates on presenting the dramatic and creative experience.

In regard to making higher education accessible to those who would otherwise be unable to acquire it, the university's record speaks for itself. For example, of the total 1974 registered enrollment, 13.7 percent were housewives, 30.3 percent were teachers, and an additional 52.7 percent were employed or in the Armed Forces. In addition, 1973 registered enrollments included 29.3 percent of those having terminated their education by age 16. It can be assumed that these individuals would be unable to register in the traditional higher educational system.

d. Effectiveness

Here the issue is twofold: effectiveness of the total course and effectiveness of the ETV portion of that course. In the first instance, an indicator is the number of students who received credit which ranged from 75-92 percent in 1971, for example. The highest rate of examination success was in the arts, with 5,318 students taking the final examination and 5,232 receiving credit or approximately 98 percent. Similar percentages for examination success in 1971 for mathematics, science and social sciences are 82, 91 and 97 percent respectively. In 1973, the record indicates that 3,603 students graduated and 45,602 took final examinations in 49 courses resulting in the award of 45,201 credits [29].

Turning to the ETV portion of the course, an indicator of its effectiveness is the fact that between 85 and 98 percent of the students follow the ETV programming. Another indicator is that the science faculty has advised students who cannot receive the ETV programs not to enroll in their courses [28].

References (Appendix A)

[1] Phone conversations with Mr. George Ropp, Supervisor of TV Instruction, and Mr. Gene Mittel, principal of a vocational high school, Washington County Schools, Hagerstown, Maryland, October 1972.

[2] Phone conversation with Mr. Allen Cuppy, Anaheim City Unified School District, Anaheim, California, October 1972.

[3] Phone conversation with Mr. Robert Reed, Coordinator, Instructional Television, Santa Ana Unified School District, Santa Ana, California, October 1972. Also material from "ITV: From Inception to Implementation, a Study of Santa Ana Instructional Television" as excerpted in "An Assessment of the Instructional Television System in California," a report to the Joint Committee on Textbooks and Curriculum, California State Legislature, by Arthur Bolton Associates, Sacramento, California, May 15, 1972.

[4] Phone conversation with Mr. Walter E. Ulrich, State Director, Vocational-Technical Education, Utah State Board of Education, Salt Lake City, Utah, September 1972. Documentation of the development of program materials is given in J.H. Straubel, "The Evaluation of Three U.S. Air Force Instructional Systems within Civilian Education," Aerospace Education Foundation, Washington, D.C., December 31, 1969.

[5] Phone conversation with Mr. Frank W. Widmann, Manager, Engineering Professional Development, RCA, Camden, New Jersey, October 20, 1972.

[6] Waniewicz, I., Broadcasting for Adult Education: A Guidebook to World Wide Experience, United Nations Educational, Scientific and Cultural Organization, Paris, France, 1972.

[7] Workshop on Continuing Education for Engineers, workshop documentation, Dallas/Fort Worth, Texas, August, 1974.

[8] Kitzes, Esther, and Helen Knos, "Britain's Open University; A Report to the Task Force on External Studies of the University of Pittsburgh," Pittsburgh University, July 1972.

[9] Bretz, Rudy, "Three Models for Home-Based Instructional Systems Using Television," RAND R-1089-USOE-MF, October 1972.

[10] Schramm, Wilbur, et al., The New Media: Memo to Educational Planners, Unesco: International Institute for Educational Planning, Paris, France, 1967.

[11] Chu, G.C., and W. Schramm, Learning from Television: What the Research Says, National Association of Educational Broadcastors, Washington, D.C., 1967.

[12] Reid, J.C., and D.W. MacLennan, "Research in Instructional Television and Film," U.S. Department of Health, Education and Welfare, Washington, D.C., 1967.

[13] Jamison, D., P. Suppes and S. Wells, "The Effectiveness of Alternative Instructional Methods: a Survey," Research Paper No. 110, Graduate School of Business, Stanford University, September 1972.

[14] Clark, D., et al., "The Chicago TV College," unpublished report, Stanford University, Stanford, California, June 6, 1975.

[15] Phone conversation with James F. Zigerell, Executive Dean, Chicago TV College and Learning Resources Laboratory, Chicago, Illinois, July, 1975.

[16] Clark, D. et al., op. cit.

[17] Zigerell, James F., Chicago's TV College: A Fifth Report, Learning Resources Laboratory, City College of Chicago, Illinois, January 1974.

[18] Phone conversation with Gary G. Goldsberry, Executive Coordinator, KOCE-TV Telecourses, Coast Community College District, Costa Mesa, California, July 1975.

[19] KOCE-TV Telecourse Evaluation, Coast Community College District, Office of Institutional Research, Costa Mesa, California, December 1974.

[20] Phone conversation with Kenneth S. Down, Assistant Dean, School of Engineering, Stanford Instructional Television Network, Stanford, California, July 1975.

[21] Stanford Engineering News, January 1974.

[22] Clark D., et al., "The Stanford Instructional Television Network," unpublished report, Stanford University, California, May 1975.

[23] Phone conversation with Charles M. Davis, General Manager, Association for Continuing Education, Stanford, California, July 1975.

[24] Workshop on Continuing Education for Engineers, op. cit.

[25] Phone conversation with Dr. Harold Livingstone, Director, Kidder Hall TV Center, Oregon State University, Corvallis, Oregon, July 1975.

[26] Phone conversation with Ms. Betsy Owens, secretary to Dr. Barry Shorthouse, Director North American Office, The Open University of the United Kingdom, Washington, D.C., July 1975.

[27] Phone conversation with Tony Meilor, McGraw-Hill Publishers, New York, N.Y., July 1975.

[28] The BBC and the Open University, Broadcasting House, London WIA IAA, October 1974.

[29] Media Development Group of the Open University, What Is The Open University: A Brief Explanation, The Open University, Walton Hall, England, 1974.

APPENDIX B

SURVEY RESULTS -- ETV USE

Detailed information is contained in this Appendix on the following institutions in the order listed:

1. Chicago TV College
2. Coast Community College District
3. Outreach Consortium
4. Stanford University
5. Association for Continuing Education
6. Oregon State University
7. British Open University

TABLE 3A-1

Chicago TV College: ETV Course Use [15,16,17]

Open circuit telecast to Chicago area over city's educational television station; TV College is an extension of Chicago Community College District.

TV Instructor		
	. Academic Position	Associate Professor.
	. Degree	60% Ph.D.
Mentor Qualifications		In some cases, where recitation and/or lab is needed, no mentor used (see following examples for Spanish and Child Development). In cases requiring a heavy load of correspondence, e.g., English composition, additional instructors may be required to grade papers, etc. (union regulations preclude the use of nonprofessional staff such as Teaching Assistants (TAs). This example is not further pursued in this case study.
Student/Staff Interaction		
	. E.G. #1: Child Development	TV instructor handled entire enrollment of 550 students, scheduled 3-4 optional face-to-face conferences during quarter, and was available for telephone counseling on a regular basis.
	. E.G. #2: Spanish	TV instructor scheduled mandatory recitation sessions for 210 credit students 7 times during quarter and maintained regularly scheduled hours for telephone conferencing.
Total ETV		4 credit courses/semester (1975) 30 TV segments per course - 45 minutes each 90 hours/semester (Repeated 2 x each week - 180 hours/semester total broadcast)

Table 3A-1 - Cont'd.

TV Instructor's Time

. Preparation	In the two examples, the TV instructor developed the course -- see design and production information in Table 5A-1.
. With Students	E.G. #1: Child Development: Out of 550 enrollment, 358 students were retained (defined as going on for credit). 3-4 optional conferences of 75 minutes each were offered; 20% of the enrollment attended these. Same percentage took advantage of the 2.5 hour telephone conferencing time per week.

Conference time	314 hrs./semester
Telephone time	38 hrs./semester
Total	352 hrs./semester (23.5 hrs./week)

E.G. #2: Spanish: Instructor handled enrollment of 210 for credit students, meeting with 2 sections of 35 students each in 3 learning centers 7 times during semester. In addition regular telephone hours were arranged.

Recitation sessions time	70 hrs./semester
Telephone time	38.5 hrs./semester
	108.5 hrs./semester (7 hrs./week)

. Administration	E.G. #1: Child Development: 3 projects were assigned each requiring a 3-4 page report which had to be read and graded. In addition each student's performance had to be judged on basis of tests, conferences, etc. Exact time allocation is not available but this was considered a full load for the teacher.

E.G. #2: Spanish: Time allocation not available.

TABLE 3A-2

Indicators of Efficiency and Effectiveness
of Chicago TV College

Indicator	Measure	Result
Number of students handled by an instructor	Total, Number	210-550
Number of students handled off campus	Number of total annual TV enrollment not requiring campus involvement	7,200
Number of students participating who might otherwise be unable to do so	Number of women enrolled (% of homebound not known)	6,750
	Number of prisoners and handicapped enrolled[1]	1,260
	Number of overseas enrolled	9,000
	Number of students enrolled in Studies Unlimited	385

[1]Based on average of 14% in this category enrolled in spring 1975.

TABLE 3A-3

Coast Community College District:

ETV Course Use [18, 19]

Telecast via public UHF television station, owned and operated by Coast Community College District consisting of Orange Coast College and Coast Community College. Covers district population of 450,000 plus 1,000,000 residents of Orange County. Offers postsecondary courses

TV Instructor	
. Academic Status . Degree	In this case, courses are produced on video using combined skills of educational consultants and TV production experts; thus TV instruction combines narration, film, etc., in a documentary style and may or may not use an "Educator" on the film presentation (Ref. Goldsberry).
Principal Instructor (User Institution)	2 year college -- MA or Ph.D. 4 year university -- Ph.D.
Other Institution or Mentor in Department of User Inst.	Courses are designed to be adapted to fit needs of user institution. Thus 1 instructor at MA or Ph.D. level may handle entire enrollment of 600, or course may be subdivided into 4 sections under supervision of principal instructor with range of TA to Associate Professor handling section, and academic qualifications ranging from BA/BS to Ph.D.
Student/Staff Interaction	Varies from course to course and from user institution to user institution. E.G.: 1 instructor in Psychology may handle 600 students with large clerical staff to handle correspondence, computer to grade tests, etc., or 1 instructor in Free Hand Drawing may handle 150 ETV students with large staff of reviewers (paraprofessionals).

Table 3A-3 - Cont'd.

Total ETV	(Courses are comprised of 30 30-minute segments). 5 or 6 courses per semester. 75-90 hours.
Instructor in User Institution	
. Preparation to Use ETV	Range: From (1) total reliance on ETV course in which case time would be allocated to course review, scheduling among other faculty and/or clerical staff, etc., to (2) preparation for discussion class (2 hours per/hour class).
. With Student	Range: E.G. - User institution may have 24-hour automated answering service. Majority of calls are such that clerical staff can answer questions. Instructor may designate 2 to 8 hours a week for telephone conferencing on content-oriented questions. Face-to-face interaction may or may not occur in discussion classes. Less than 2% of enrollment in spring 1974 classes had "frequent contact".
. Administration	No time estimate -- i.e., conceivably a large clerical staff can handle mailings, computers can be used to grade exams, etc.

TABLE 3A-4

Indicators of Efficiency of
Coast Community College District

Indicator	Measure	Result
Number of students handled by one instructor	Total number	150-600[1]
Use of less qualified instructional staff	Number of TAs with Bachelor's degrees per instructor	4:1[2]
Number of students handled off campus	Total ETV enrollment spring 1974	3,230
Number of students participating who might otherwise be unable to do so	Number of students responding to this question in the affirmative	1,615

[1]Based on example of Psychology course with total enrollment of 600.

[2]Based on one user institution dividing total Psychology enrollment of 600 among four TA-led sections.

TABLE 3A-5

Outreach Consortium: ETV Course Use [18]

Consortia composed of 18 institutions of higher education in Orange and San Diego counties in Southern California with purpose of combining education and TV resources to produce high quality educational TV for post-secondary level. Pilot project was released in September 1975. Was offered in immediate area as well as statewide on open circuit TV, CATV, etc.

TV Instructor	
. Academic Status	Combines experts from education, business, government and medicine.
Principal Instructor (User Institution)	2 year college -- MA or Ph.D. 4 year university -- Ph.D.
Other Institution or Mentor in Department of User Inst.	Information not available since first consortium-produced course offering began 9/75.
Student/Staff Interaction	Information not available.
Total ETV	(20 30-minute ETV programs) 15 hours ETV.
Instructor in User Institution	
. Preparation to Use ETV	One example available: University of California at Irvine was planning to offer 9 live lectures by experts to complement the ETV material. Data on exact time allocation unknown at present.
. With Student	No information.

TABLE 3A-6

Stanford University Engineering Telecourses:

ETV Course Use [20,21,22]

Lecture replacement with instructor teaching in-class students simultaneously with remote site students over Instructional Television Fixed Service Network (ITFS); feedback provided by two-way audio capability.

TV Instructor		
	. Academic Status	Range: Visiting professors, department heads, full and associate professors.
	. Degree	Majority with Ph.D.
Mentor		
	. Qualifications	Live: None used specifically for TV students, however instructor may be assisted by TA. Video: At remote sites, tutor with equivalent qualifications as a TA at Stanford.
Student/Staff Interaction		Live: Two-way audio with instructor; courier service to take materials to and from remote site. Video: Tutor watches program with students and leads discussion.
Total ETV		1973-74 150 courses delivered to 2,008 students at 36 remote sites. Approximately 4,230/hours/year (capacity - 5,000 hours/year).
TV Instructor Time		
	. Preparation to Use TV	1/2 hour instruction for first-time user of ITFS delivery system.

TABLE 3A-6 - Cont'd.

. With Students	Live interaction with two-way audio. Minimal face-to-face (see text).
. With Tutors	None.
. Administrative	Minimal for TV students The TA working with the Stanford professor will probably handle administrative details for TV students and in-class students.
Tutor's Time	
. Preparation to Use ETV	N.A.
. With Students	Live: N.A. Video: 1-1/2 hours per 45-50 minutes of TV instruction to watch and discuss program.
. With TV Instructor	N.A. (see text).
. Administration	Minimal (see text).

TABLE 3A-7

Indicators of Efficiency of
Stanford University Engineering Telecourses

Indicator	Measure	Result[2]
Number of students enrolled off campus	Total enrollment 1972-1973	2,029 -HCP 562 -NRO 95 -AUD 1,372
Number of students handled entirely off-campus[1]	% of total ETV enrollment not requiring campus involvement	1,826
Savings in student time	Number of hours of commute time for HCP students @ 3 hours/commute @ 1.5 hours/commute	 108 hours/qtr. 54 hours/qtr.
Savings in commute cost	Number of miles x $.15/mile -80 miles round trip -40 miles round trip -20 miles round trip	 $432/qtr. $216/qtr. $108/qtr.
Total savings in student time for HCP students	-HCP enrollment x 3 hours commute time -HCP enrollment x 1.5 hours commute time	60,969 hrs./yr. (1,517 man-weeks of work) (or 29 man-years) 30,348 hrs./yr. (759 man-weeks of work) (or 14.6 man-years)
Total savings in commute cost for HCP students	-HCP enrollment x 80 miles @$.15 -HCP enrollment x 40 miles @$.15 -HCP enrollment x 20 miles @$.15	$242,784 $121,392 $60,696

[1]Honors Cooperative Program students have the option of attending classes on campus and using campus facilities. In fact a very small percentage do so.

[2]HCP - Honors Cooperative Program; NRO - Non-registered Option; AUD - Auditing.

TABLE 3A-8

Association for Continuing Education:
ETV Course Use [22,23,24]

Lecture replacement for 77% of enrollment in live interactive format through two-way audio; videotape transmission for 23% of enrollment; delivery by ITFS system.

TV Instructor		
	. Academic Status	Range: academic faculty and ad hoc faculty recruited from government, industry and consulting organizations.
	. Degree	Range: BS/BA to Ph.D.
Mentor		
	. Qualifications	None used for live or video with one exception (see text).
Student/Staff Interaction		Live: Two-way audio w th instructor; courier service to take materials to/from remote site.
		Video: Minimal interaction.
Total ETV		1973-74 74 courses delivered to 2,670 enrollments at 20 remote sites [23]
		Approximately 1,600/hours/year (capacity - 2,500 hours/year).
TV Instructor Time		
	. Preparation to Use TV	Range: From 1/2 hour for professional teacher on how to use ITFS delivery system to 8 hours for nonprofessional teacher on how to use TV media.
	. With Students	Live interaction with two-way audio.

TABLE 3A-8 - Cont'd.

	Minimal face-to-face; e.g., a dinner is planned once a semester to bring MBA students together with instructor.
. With Tutors	None.
. Administrative	Minimal.
Mentor's Time	
. Preparation to Use ETV	N.A.
. With Students	N.A.
. With TV Instructor	N.A.
. Administration	N.A.

TABLE 3A-9

Indicators of the Effectiveness and Efficiency of the ACE Program

Indicator	Measure	Result
Number of students enrolled off campus	Total enrollment 1973-1974	2,670
Total savings in student commute time/year	Number of hours commute time x total enrollment[1]	
	@ 3 hours/round trip	288,360 hrs./yr. (or 139 man-years)
	@1.5 hours/round trip	144,180 hrs./yr. (or 69.5 man-years)
Total savings in commute cost (year)	-Total enrollment x 240 miles/week for 12 weeks @$.15/mile	$1,153,440
	- x 120 miles/week	$576,720
	- x 60 miles/week	$288,360
Increase in student population 1969-70 to 1973-74	-Total increase	617
	-% increase	74%
Increase in industrial users 1969-70 to 1973-74	-Total increase	18
	-% increase	100%

[1] Based on three courses/week and a 12-week quarter.

TABLE 3A-10

Oregon State University: ETV Course Use [25]

ETV material telecast over Cable TV system in Corvalis, Oregon (more than 6,000 subscribers to CATV system). Postsecondary courses. Majority of ETV material produced at OSU. Seventy percent of enrollment is off-campus.

TV Instructor	
. Academic Position	Associate Professor or Professor.
. Degree	Ph.D.
Mentor Qualifications	Range from instructor, to TA, to advanced undergraduate.
Student/Staff Interaction	TV instructor will take section of 30 students, with TAs taking sections of 30 students. In addition to ETV, recitation periods are included, and where applicable, laboratory periods. TV instructor visits each TA section once per quarter for recitation, and is available to students during week for tutoring, etc. Average enrollment of 700/course with 70% viewing off-campus.
Total ETV	50 hours/week (600 hours/quarter).
TV Instructor's Time	
. Preparation to Use	N.A. - Has participated in planning and design (see Table 5A-6)
. With Students	E.G. Biology: Conducts 1 hour lab and 1 hour recitation per week (24 hrs./qtr.) Visits each recitation section once per quarter (23 hrs./qtr.) Is available 1 afternoon/week (48 hrs./qtr.)

TABLE 3A-10- Cont'd.

. With Mentors	Conducts initial training period of 4-6 hours. Meets with TAs two hours per week (24 hrs./qtr.).
. Administration	Varies with availability of TAs to assist in administration.
Mentor's Time	
. Preparation to Use ETV	Minimum of 2 hours per class hour (48 hrs./qtr.)
. With Students	E.G. Biology: 1 hour lab and 1 hour recitation per week (24 hrs./qtr.)
. With Instructor	Initial training period of 4-6 hours. Meets with instructor 2 hours/week.
. Administration	2 hours/week.

TABLE 3A-11

Indicators of Efficiency and Effectiveness
Oregon State University's ETV Use

Indicator	Measure	Result
Number of students handled by principal instructor	Total increase	700[1]
Number of students taking a portion of their course off campus	Total number/year	5,950
Additional instructors required if TAs could not be used	5 class sections of students per quarter	40
Faculty hours saved per quarter by closed-circuit TV	Number of hours of programming x 12 weeks	1,200 hrs./qtr. (30 man-weeks)
Savings in preparation time for courses	Total yearly ETV course hours x 2 hours per 1 hour of class, with 30:1 instructor/student ratio	1,699 hrs./yr. (43 man-weeks)
Savings in preparation time for all courses	100/hours/week on closed-circuit x 2 hours per in-class hr.	10,400 hrs./yr. (260 man-weeks) (or 5 man-years)

[1]Based on the Biology course model where TAs were responsible for individual sections of 30 students each.

TABLE 3A-12

British Open University: ETV Course Use [26,27,28,29]

A combination of text, self-assessment tests, supplementary reading, ETV and educational radio.

	Foundation Level	Higher Levels
TV Instructor		
. Academic	Full-time academic at OU.	Full-time academic at OU.
. Degree	Range from BA/BS to Ph.D.	Range from BA/BS to Ph.D.
Mentors		
. Tutors/ Counselors	Majority are professional educators employed on a part-time basis and holding at least a Bachelor's degree — at the foundation course level, each student is assigned to a mentor serving the combined counselor/tutor function.	Same qualifications as with foundation tutor/counselor. At higher level, a student is assigned to one tutor and one counselor, each serving separate functions.
Student/Staff Interaction	Tutor/Counselor: Responsible for correcting written exams, carrying out tutorial correspondence, assessing student performance, counseling for improved student efficiency, holding group tutorial sessions, maintaining individual contact at study centers and on telephone; one per 12 students. Summer Sessions: Mandatory for foundation courses — student interacts with faculty from OU (probably TV instructor), OU tutors, and staff at host university in formal seminars, informal discussions and project work.	Tutor: Has primary responsibility for correspondence. See [28]. Corrects and comments on written exams, maintains tutorial correspondence, conducts group tutorials, maintains telephone contact when feasible; one per 20 students (to be decreased to one per 16 in 1976). Counselor: Counsel student on progress through meetings at study center or correspondence and telephone; one per 20 students (to be decreased to one per 16 in 1976). Summer Session: Required for some upper level courses, particularly science. Same interaction as for foundation.

TABLE 3A-12 (Cont'd)

	Foundation Level	Higher Levels
Total ETV	37.5 hours weekly total over BBC. One 25-minute TV segment per week for foundation level course. Each segment broadcast twice; 34-week period.	Technology, Math, Science: One 25-minute segment per week. Education, Social Sci., Humanities: One 25-minute film every other week. Each segment broadcast twice; 34-week period per course.
Instructor's Time		
. Preparation	See Planning and Design.	See Planning and Design.
. With Students	During summer sessions lasting from July 12 to September 6 (1975).	During summer sessions lasting from July 12 to September 6 (1975).
. With Tutors/ Counselors	Tutors are arranged for and handled primarily at the regional level.	Tutors and counselors are arranged for and handled primarily at the regional level.
. Administration	The OU has 1.4 administrative and operational persons for one faculty member, so it is assumed that the time here is minimal.	
Mentor's Time (Tutors/ Counselors)		
. Preparation	Training course in OU system.	Training course in OU system.
. With Students	Tutor/Counselor: Maximum of 27 hours per week for 12 students.	Tutors: Maximum of 22.5 hours per week for 20 students. Counselors: 22.5 hours per week (based on same assumption as foundation level).
. With Instructor	This interaction takes place at the regional level so OU faculty is probably not involved. With regional faculty, one hour per week.	Same as with the foundation level.

APPENDIX C

Program Listing

1. Nomenclature

a. Input Data

N	Teacher with normal school certificate
AN	Teacher with associate degree assigned to primary school
FN	Unqualified primary school teacher
AG	Teacher with associate degree assigned to guidance cycle school
FG	Unqualified teacher in guidance cycle school
AS	Teacher with associate degree assigned to secondary school
BS	Teacher with bachelor degree assigned to secondary school
FS	Unqualified teacher in secondary school
BN	Normal school faculty with bachelor degree
BN1	BN teaching first year students
NT	Normal school mentor
NT1	NT teaching first year students
NS1	First year students at normal school
NS2	Second year students at normal school
BG	Guidance cycle training center faculty with bachelor degree
BG1	BG teaching first year students
BGT1	BG1 teaching via TV
BGC1	BG1 conventional
GMT	Guidance cycle training center mentor
GMT1	GMT teaching first year students
GT1	First year students at guidance cycle training center
GT2	Second year students at guidance cycle training center
BUT	University mentor with bachelor degree and working with TV
PU	Ph.D. university faculty
MU	Master's degree university faculty
S1-S12	Students in grades 1....12
U1-U4	University students (in education) in years 1-4

a. Input Data (cont)

P1	Master's degree candidates
P2-P4	Ph.D. candidates in postgraduate years 2-4
S1P	Population of first grade age

Input Coefficients

TAU	Population increase per year
KNS9	Proportion of S9 entering normal school
KG1	Proportion of S12 entering guidance cycle training center
KU1	Proportion of S12 entering university teacher training
KFNNIT	Proportion of F_N receiving in-service training at normal schools
KFGGIT	Proportion of F_G receiving in-service training at guidance cycle training centers
KFSGIT	Proportion of F_S receiving in-service training at guidance cycle training center
KNN	Proportion of normal school graduates assigned to primary grades
KNM	Proportion of normal school graduates remaining as mentors
KAN	Proportion of guidance cycle training center graduates assigned to primary grades
KAG	_____ assigned to guidance cycle grades
KAS	_____ assigned to secondary schools
KGM	_____ remaining as mentors
KAU	_____ entering third year at university
KBN	Proportion of bachelor degree graduates assigned to normal schools
KBG	_____ assigned to guidance cycle training centers
KBS	_____ assigned to secondary schools
KBT	_____ remaining as mentors
KBM	_____ entering master's program
KMP	Proportion of Master's degree graduates entering doctoral program
KTC	Proportion of university staff working with television
KM	Mentor/faculty ratio

Input Coefficients (cont)

KSC	_____ student-teacher ratio for conventional instruction
KST	_____ TV instructor
KSTR	Elementary and secondary student/teacher ratio
KT__	Retirement rates for:
KTFN	FN
KTN	N
KTNT	NT
KTAN	AN
KTFG	FG
KTAG	AG
KTFS	FS
KTAS	AS
KTBS	BS
KTBN	BN
KTGMT	GMT
KTBG	BG
KTBUT	BUT
KTMU	MU
KTPU	PU
TV	A "1" indicates TV is used, a "0" indicates no TV

b. Key Program Variables

These are in the order that they appear in the program

CAN CAS CAG CBN CBS CBG	Control numbers indicating that basic demands have been met and the teacher training institutions can reduce activities

____X	Teachers training institutions staff or in-service training entrants in excess of what is needed, e.g., BSX is the excess of bachelor degrees assigned to the secondary schools
____CUM	Cumulative value of ___
KDRP	Vector of student drop-out ratios.
DOS1	Number of children not accepted in first grade
DOS6	Number from fifth grade not accepted in the sixth
DOS9	Number from ninth grade not accepted in the ninth
DN	Demand for teachers to accommodate the students in grades two to five plus all the potential first grade students
FNNIT	FN going to normal school for in-service training (assumed to be full program)
NGIT	N going to guidance cycle training center for in-service training (assumed to be full program)
F678	Teachers needed to accommodate all potential students in guidance cycle
FSP4	Projected demand for guidance cycle
FSP3	Teachers in one and two years, respectively
FGGIT	FG going to guidance cycle training center for in-service training
UDN1	Estimated unmet demand for first year normal school students
BN1,BN2	BN assigned to teach first and second year students respectively
BNC1,BNC2	BN1, BN2 for conventional teaching
BNT1,BNT2	BN1, BN2 for TV teaching
BGN	BN not needed
FSS	Teachers needed to accommodate all potential secondary school students
ASUIT	Excess AS
FSGIT	FS going to guidance cycle training sector for in-service training
GT1N,GT2N GT1G,GT2G GT1S,Gt2S	First and second year trainees designated for assignment to primary school (N), guidance cycle school (G), or secondary school (S)
GIT	Total in-service applicants

b. Key Program Variables (cont)

FS567, FS456	Estimated demand for guidance cycle teachers in one and two years, respectively
UDAG1	Projected unmet demand by guidance cycle schools for guidance cycle training center graduates in one year
UDAN1	Projected unmet demand by primary schools
UDAS1	Projected unmet demand by secondary schools
DGT1N DGT1G DGT1S	Estimated demand for guidance cycle training center graduates in primary (N), guidance cycle (G) and secondary (S) schools.
MUT,PUT	MU,PU teaching with TV
MUC,PUC	MU,PU teaching conventionally
PUP1	PU teaching masters candidates P1
TRAN	Applicants for admission to third year of university
DBS,DBG DBN	Projected demand for BS,BG,BN in four years
TRES	Number of TRAN not admitted to third year of university
KTP	Fraction of university staff not needed

c. Output Terms

S1PCT,S5PCT, S8PCT,S12PCT	The percentage of the age group in the indicated grade level